

Effects of Uninsurance during the Preceding 10 Years on Health Status among Rural Working Age Adults



At the Heart of Public Health Policy

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on Health Status among Rural Working Age Adults**

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Executive Summary

Our study sought to determine if individuals with longer periods of uninsurance, in multivariable analyses controlling for income, poverty and health status/behavior at the beginning of the time period, will be more likely to be overweight, to report experiencing hypertension or diabetes, or to describe their health as “fair” or “poor.” We also looked to see if the effects of uninsurance would be greater in rural than in urban respondents, and greater for minority rural populations than for white rural populations.

Key Findings

Effects of Uninsurance

- In a population just reaching age 40, continuous health insurance coverage across the preceding 8 to 10 years was not associated with better self-perceived health, as measured using the SF-12 Physical Component Score, than interrupted coverage. A positive relationship between insurance coverage and health in unadjusted analysis, which remained after controlling for race and residence, ceased to be significant after age, education, marital status, and poverty during youth were held constant.
- Similar results were found when health status was dichotomized into “fair to poor” versus better self-perceived health.
- Health insurance was not significantly related to the probability that a respondent would report a high BMI (obesity), or would have been diagnosed with hypertension or diabetes.
- Continuous insurance coverage was significantly related to better mental health, as measured by the SF-12 Mental Component Score. The effect persisted in multivariable analysis controlling for residence, race, and demographic characteristics.

Effects of Rural Residence and Race

- Rural residents reaching age 40 in 1998 or 2000 were less likely to have been continuously insured between 1989 – 2000 than were their urban peers. Among whites, 57.2% of rural residents were continuously insured versus 66.4% of urban residents ($p=0.0009$). Similar but non-significant trends were found among African Americans (37.0% versus 44.7%; $p=0.1098$) and among Hispanics (37.7% versus 44.1%; $p = .4114$).
- With differences in insurance coverage, residence, education, marital status, age, and poverty in young adulthood held constant, African Americans and Hispanics in the study did not perceive themselves to have poorer physical or mental health than whites. The effects of lack of insurance were not greater in rural than in urban areas and were not greater for minority rural populations than for white rural populations (no significant interactions).
- The odds that an individual would experience obesity, and hypertension and diabetes varied by race. Obesity and diabetes were more common among both African Americans and Hispanics at age 40 than among whites. Diabetes was more likely to be reported by African American respondents (Table 10).
- Over the 1989 – 1998/2000 period, slightly more than a third of rural minority respondents (37%) were continuously insured. While rural whites were more likely to be continuously insured (57%) than rural minorities, 43% of rural whites experienced

periods without insurance. Rural whites were significantly less likely to report continuous insurance than were urban whites.

Policy Recommendations

- The Department of Health and Human Services should evaluate how its component agencies can best support local programs working to improve access to care for uninsured populations. Working with organizations such as the American College of Healthcare Executives, the American Hospital Association, and the National Rural Health Association, DHHS should ensure that best practices among such local efforts are identified and shared. Technical assistance materials developed to document best practices should be available to, and understandable by, non-specialist community leaders.
- The Secretary of the Department of Health and Human Services should work with the National Association of Rural Health Clinics, the National Rural Health Association, and the National Association of Community Health Centers to define model approaches to involving RHCs in the care of uninsured persons. It would be particularly valuable to document collaborations among RHCs, CHCs, and other service providers, and to communicate the information broadly to state and local planners.
- In partnership with local mental health professional organizations, Area Health Education Consortia are encouraged to develop strong educational programs in mental health screening, treatment, and referral for family medicine, internal medicine, and general surgery resident physicians, and for nurses. Such educational content is needed both during practitioner training and as part of continuing medical education programs.
- State Area Health Education Consortia are encouraged to partner with local middle and high schools in an attempt to promote health careers, both as a means of encouraging children to higher educational attainment and as a way of growing a local health labor force. Such activities should be particularly promoted in rural areas.
- State Area Health Education Consortia are encouraged to partner with agencies in their state responsible for implementation of the WIA, in order to identify health careers job training opportunities that may benefit rural residents and institutions.

Research Recommendations

- The youngest members of the NLSY-79 cohort reach age 40 in 2005. When public use data are available for the full NLSY-79 cohort, the analysis reported here should be repeated. With larger sample sizes, many limitations of the present analysis may be obviated. For example, more detailed definitions of “rural” and “insured” will be possible.
- Poverty at ages 19 – 21 appears to have lasting effects on perceived mental and physical health. This long-term effect may result from culture as learned in youth, from employment choices, or from other factors not included in the present analysis. Identification of factors which ameliorate the effect of early poverty, which may include education, employment in varying occupations, and so on, is essential.

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Chapter One

Introduction

Background

A fundamental assumption in health services research is that being uninsured leads to poorer health status due to a lack of access to care (Davis, 1997). Losing insurance, whether it is Medicaid or private insurance, leads to an increase in the proportion of persons who report no usual source of care, an increase in the proportion who report barriers to accessing care, and an increase in the proportion who report dissatisfaction with their ability to obtain needed care compared to those who kept their insurance or gained insurance (Kasper, Giovannini, and Hoffman, 2000). Similarly, persons whose insurance coverage is interrupted, report significant access barriers (Schoen, DesRoches, 2000). Uninsured adults make fewer health care visits than their insured counterparts (Mueller, Patil and Ullrich, 1997; Comer, Mueller, Blankenau, 2000; Ayanian, Weissman, et al, 2000). Reduced visit frequency, in turn, has been associated with poorer outcomes for hypertension and vision correction (Keeler, Brook et al, 1985; Lurie, Kambert et al, 1989). However, lower visit frequency associated with high coinsurance requirements was not associated with other health outcomes in the Rand Health Insurance Experiment, which tracked differently insured populations for three to five years (Keeler, Brook et al, 1987).

Rural populations are known to have lower rates of health insurance, with rural minorities being more likely to lack insurance than either rural whites or urban minority populations (Glover, Moore et el 2004; Probst, Moore, in press). Uninsured rural residents, in turn, are significantly less likely to report a health care visit during the past year than their peers, even controlling for factors such as self-perceived health status, education, and employment (Glover,

Moore et al 2004). The long term effects of rural residence and insurance, however, are not yet known.

Objectives of Our Research

We sought to examine the effects of lack of health insurance and rural residence simultaneously over time, using a unique long-term study, the National Longitudinal Survey of Youth 1979 (NLSY). The NLSY, as its name implies, originated as a study of young people (ages 14 – 21). The members of the original 1979 panel have been surveyed at regular intervals for the subsequent 25 years. Beginning in 1989, the NLSY included questions regarding health insurance coverage. When respondents turn 40, the survey added a series of health-related questions. Working with the publicly available data sets from each year of the NLSY, we are able to examine how health insurance status and rural residence (defined as living in a non-metropolitan county) work jointly to influence health status indicators in early middle age.

The study had two objectives:

- To ascertain whether periods of uninsurance over time, in multivariable analyses controlling for income, poverty and health status at the beginning of the time period, lead to poorer health outcomes at age 40. The outcomes studied include self-reported mental and physical health status, body mass index (BMI), and diagnosed disease (hypertension, diabetes).
- To ascertain whether the effects of uninsurance are greater for rural than for urban respondents, and greater for minority rural populations than for white rural populations.

Outcome measures

Health Status: Because of the difficulty and prohibitive cost of conducting physical examinations for survey research, much research depends on individual's reports of their own health. We use two self-report measures for physical health: a general self-report of health, and

the SF-12 Physical Component Score. Previous studies of the effects of insurance, both cross-sectional and longitudinal, have used such subjective measures of health status. Some cross-sectional research has found the subjective health status of adults without insurance to be lower than the subjective health status of those with insurance (Franks, Clancy, et al, 1993). Type of insurance also affects self-perceived health; persons receiving public insurance often report poorer health status than either privately insured or uninsured persons (e.g., Ross and Mirowsky, 2000). However, longitudinal studies of the relationship between insurance coverage and health offer conflicting results. Over a two-year period, working age adults who lost health insurance coverage or had gaps in coverage, compared to their continuously insured peers, were not more likely to experience an adverse event due to health (Kasper et al, 2000) or to perceive their health status as fair to poor (Schoen, DesRoches, 2000; Kasper et al, 2000). On the other hand, Baker, Sudano and colleagues, in several analyses of adults ages 51 to 61 across a four-year period (1992 –1996), found poorer health outcomes among continuously uninsured and intermittently uninsured than among continuously insured (Baker, et al., 2001, 2001, 2002). Differences in findings between the two sets of studies may stem from differences in the time period (two versus four years) or in the ages of the study participants.

Rural working age adults report poorer health status than their urban counterparts (Glover, Moore et al, 2004). The effects of rural residence when insurance status over time and other variables are held equal has not yet been examined.

Mental health status: Accurate clinical assessment of the prevalence of mental disorders would be as prohibitively expensive as clinical assessment of physical status. Thus, we again rely on a standardized self-report proxy, the SF-12 Mental Component Score. While the Rand Health Insurance Experiment found no variation in self-reported mental health status among

insured persons with high coinsurance requirements (Wells, Manning, Valdez, 1989), that research did not address the situation of completely or intermittently uninsured persons. More recent work has linked health insurance to mental health status, although only among single persons (Ferrer, Palmer, Burge, 2005).

Chronic disease and risk factors: hypertension, diabetes, and obesity. The NLSY inquired about a variety of health conditions, such as arthritis, diabetes, hypertension, cancer, and other diagnoses. In the age-40 NLSY population, most conditions were rare. The number of persons who had developed hypertension or diabetes, however, was large enough that the effects of rural residence and insurance on the prevalence of these two conditions could be studied. Hypertension and diabetes are more common among minorities, including rural minorities (Mainous, King et al 2004). Both conditions are associated with physical inactivity and obesity; inactivity and obesity, in turn, are more common in rural areas and among rural minorities in particular (Patterson, Moore et al, 2003). The rationale for studying these conditions, beyond their prevalence, is the possibility that appropriate access to care would expose an individual to more frequent counseling about diet, exercise and weight, thus lowering the prevalence of obesity and its potential sequellae, hypertension and diabetes (USPTS, 2003). Among individuals in late middle age, uninsured and intermittently insured persons have been shown to reduce their use of health care (Johnson and Crystal, 2000), particularly preventive services (Sudano and Baker, 2003). Reduced use of care might eventually result, we hypothesized, in an increased prevalence of disease.

Report Format

The principal results of the study are presented in Chapter Two, with conclusions and policy implications offered in Chapter Three. Details about the National Longitudinal Survey

of Youth – 1979 and about the methods used for this report are presented in Appendix A, while the detailed tables of analytic results are provided in Appendix B.

Chapter Two

Results

Population Studied: A National Sample of “Youth” in 1979

We analyzed data from the 1998 and 2000 administrations of the National Longitudinal Survey of Youth--1979, limiting the analysis to persons who turned 40 in one of those years. At age 40, survey participants were asked a variety of questions pertaining to their physical and mental health. A total of 3,164 respondents, aged 19 through 21 when originally contacted by the NLSY in 1979, reached age 40 by the 1998 or 2000 survey. Among these, 3,104 had sufficiently complete residence and insurance information each year to be included in the current analysis. A more detailed discussion of the dataset and methods can be found in Appendix A. All Tables are located in Appendix B.

About half of the respondents were white, nearly a third were Hispanic and approximately one-fifth were African American (Table B-1). The study group contained slightly more women than men, a pattern consistent across race/ethnicity groups. Minority groups differed from white respondents in several characteristics linked with health. African Americans were about twice as likely and Hispanics nearly three times as likely as whites to have less than a high school education. However, the proportion of persons with a college degree or better did not differ across race/ethnicity. Whites were markedly more likely to be married (72.5%) than were African Americans (36.5%); Hispanics were similar to whites (60.9% currently married).

The National Longitudinal Survey of Youth (NLSY-79), commissioned by the Bureau of Labor Statistics, is one of the nation's longest running panel surveys (NLSY79, 2001). This multistage, stratified clustered sample was initiated in 1979. Participants were interviewed annually from 1979 through 1994, and biannually until present, with an 84% retention rate through 1998.

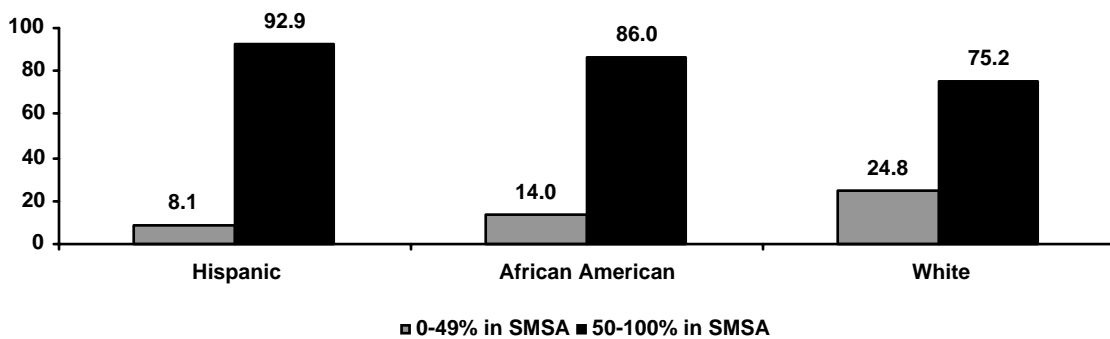
In 1979, 38.9% of African American youths surveyed by the NLSY, and 28.8% of Hispanic youths, were in poverty, compared to only 9.9% of whites. By comparison, the 1980 Census found 11.4% of white children aged 18 and below to be living in poverty in 1979, as well as 40.7% of African American children and 27.4% of Hispanic children (Bureau of the Census, 1981). Differences between the Census population and that studied by the NLSY are probably attributable to age differences, as the NLSY respondents were aged 14 – 21 in 1979. Decreases in the proportion of respondents living in poverty between initial 1979 interviews and age 40 interviews are worth noting. The proportion of Hispanics living in poverty decreased by 47%, African Americans by 36%, and whites by 24% (Table B-1). Nonetheless, given the differences in starting proportions, poverty continued to be more prevalent at age 40 among minority adults (24.8% among African Americans, 15.2% among Hispanics) than among whites (7.5%). Persons were more likely to remain poor between 1979 and 1998/2000 than to become poor. Among persons who were poor in 1979, 22.7% remained poor when interviewed at age 40, while among persons not in poverty in 1979, only 7.7% were poor at age 40 ($p=0.0000$).

Key Measure: Rural Residence

Residence changed over time, making identification of a “rural” population problematic. In 1979, about a third of white youths (34.6%), one-quarter (25.9%) of African American youths and 16.1% of Hispanic youths surveyed lived outside of metropolitan areas. By age 40, however, the proportion of individuals currently living in non-metropolitan areas had dropped to 9.8% for whites, 5.2% for African Americans, and 3.5% for Hispanics. Since our insurance measure only covered the period 1989 through 2000, for consistency in exposure variables, we defined residence using the same time period. To characterize persons as “urban” or “rural,” we used the proportion of time each respondent lived outside a metropolitan area during the 1989 –

1998/2000 time period.¹ As shown in Figure 1, most respondents resided most of the time in urban areas. When characterizing respondents by residence, we defined them as “rural” if they had lived more than half of the years between 1989 and the time at which their health was measured (age 40) outside metropolitan areas. About a quarter of white respondents (24.8%) lived at least half of the time between 1989 and their 40th birthday in non-metropolitan areas, as did 14.0% of African American respondents and 8.1% of Hispanic respondents (See Table B-1).

Figure 1. Residence as Percent of Years Since 1989 Lived in SMSA by Race/Ethnicity



Key Measure: Health Insurance Coverage

Because health insurance was examined over approximately 12 years, the proportion of time that a respondent had coverage was used as the insurance measure. Insurance was defined as any coverage, whether public or private.² About 54% of the study population was

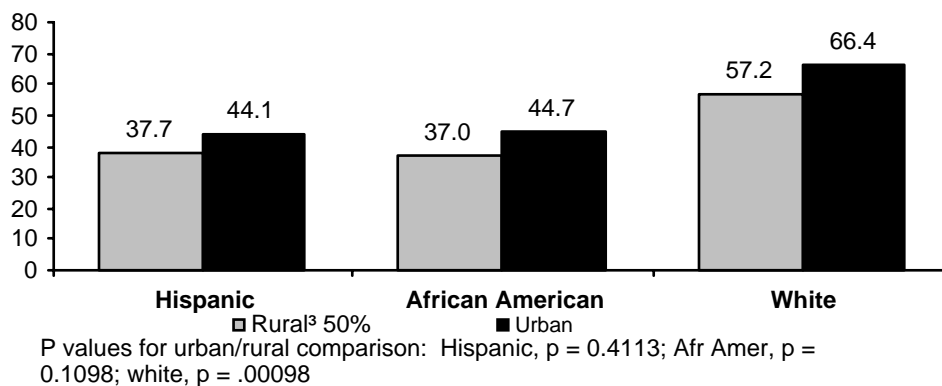
¹ To test the sensitivity of our analysis to the time period used, we also characterized residence based on the entire 1979 – 1998/2000 time frame. Results were not appreciably different; see methods section.

² The category “insured” intentionally combines private and public insurance coverage, with no attempt to distinguish between the two. Adults in the age group studied here can only obtain public insurance, principally Medicaid, for childbirth related expenses or for disability. Because Medicaid disability coverage would be provided based on poor physical or mental health, it would be too logically entwined with the study’s outcomes to be fruitful analytically. Inclusion of persons who might have received Medicaid in the “insured” group biases the study in a conservative direction, that is, makes it less likely to find that insurance coverage is associated with better health.

continuously covered throughout the years when the NLSY included questions about health insurance (1989 to 2000; Table B-2). An additional 14.8% of respondents reported being covered between 75% and 99% of the time. Only 16.7% were uninsured for more than half of the time.

Insurance coverage varied with race/ethnicity (Table B-2 and Figure 2). Whites were more likely to be continuously covered than African Americans or Hispanics. Coverage was not significantly associated with residence in 1979 or residence at age 40. However, whites living principally in urban areas during the 1989 – 1998/2000 period were significantly more likely to have been continuously insured than their rural peers (Figure 2). Differences were similar in direction for minority populations, although not statistically significant.

Figure 2. Health Insurance Coverage between 1989-1998/2000 by Race/Ethnicity

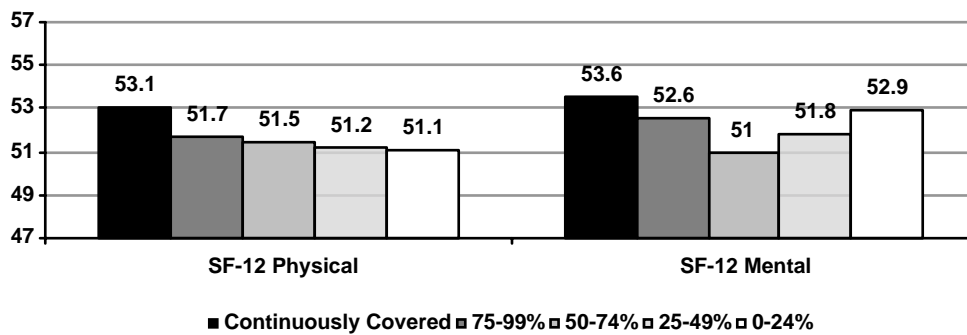


Levels of Health Insurance Coverage Across Time and Health Outcomes

To assess overall health status, the NLSY administered two commonly used instruments, the SF-12 Physical Component and the SF-12 Mental Component. These scales yield an average value of 50 in a standard population; higher values are associated with better physical or mental health (Ware, Kosinski, and Keller, 1995). In general, NLSY respondents surveyed at age 40 perceived themselves to be in good physical and mental health; mean values are above 50 on both scales across all categories of insurance coverage.

Without controlling for factors such as race, residence, or other personal characteristics, the proportion of time with insurance coverage had significant effects on both physical ($p = 0.0004$) and mental ($p = 0.0001$) health status (See Figure 3 and Table B-3). Persons who were continuously covered had the highest scores for both physical and mental health at age 40. For physical health, there is a possible threshold effect, with persons lacking continuous insurance having lower scores than persons who were consistently insured. For mental health, the relationship appears to be U-shaped.

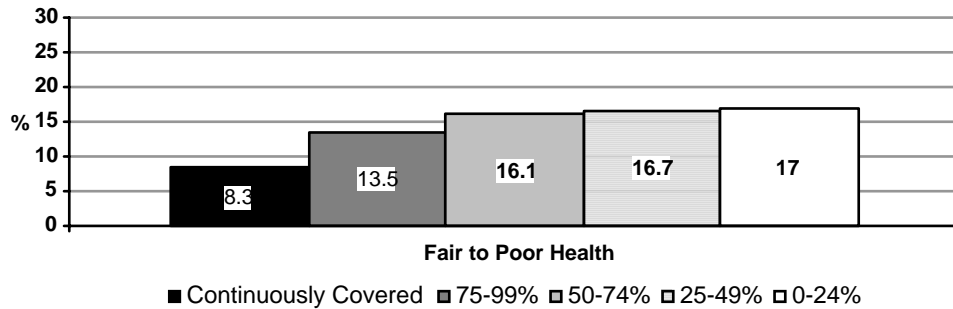
Figure 3. Physical and Mental Health Scores by Health Insurance Coverage.



The NLSY also assessed health status by asking persons to rate their own health status. Insurance coverage was positively related to good health as measured by the SF-12 Physical Component; conversely, it was negatively related to self-described ‘fair to poor’ health (Figure 4, top of next page, and Table B-3). There appears to be a threshold effect, with persons who were continuously insured or insured 75% of the time or more being less likely to report poor health.

No clear relationship emerged between the proportion of time a respondent had insurance coverage and the prevalence of self reported overweight or obesity (BMI calculated from reported height and weight), or diagnosed diabetes or hypertension. While insurance coverage

Figure 4. Percent of Respondents Reporting Fair to Poor Physical Health, by Health Insurance Coverage.



had a strong statistical relationship to self-perceived health status, no differences in diagnosed illness or obesity were statistically significant at the $p = 0.05$ level.

Health Insurance Coverage and Health Outcomes by Race/Ethnicity

To examine the effects of health insurance within race/ethnicity groups, we dichotomized the insurance measure: continuous coverage over the study period, versus coverage not continuous over the study period. Narrower insurance categories did not contain sufficient numbers of respondents of different race/ethnicity for valid estimates. Results of the analysis are shown in Figure 4 and in Table B-4.

Among Hispanics and Whites, the mean for SF-12 Physical Component was higher for persons who were continuously covered than for those who were not; differences were not significant for African Americans (Table B-4). Among whites and African Americans, the mean SF-12 Mental Component was significantly higher for those continuously covered compared to those not continuously covered; differences were not significant for Hispanics (Figure 5). The proportion of persons reporting “fair to poor” health was significantly higher among people not continuously covered across all race/ethnicity categories (Figure 6).

Figure 5. Physical and Mental Health by Race/Ethnicity and Health Insurance Coverage.

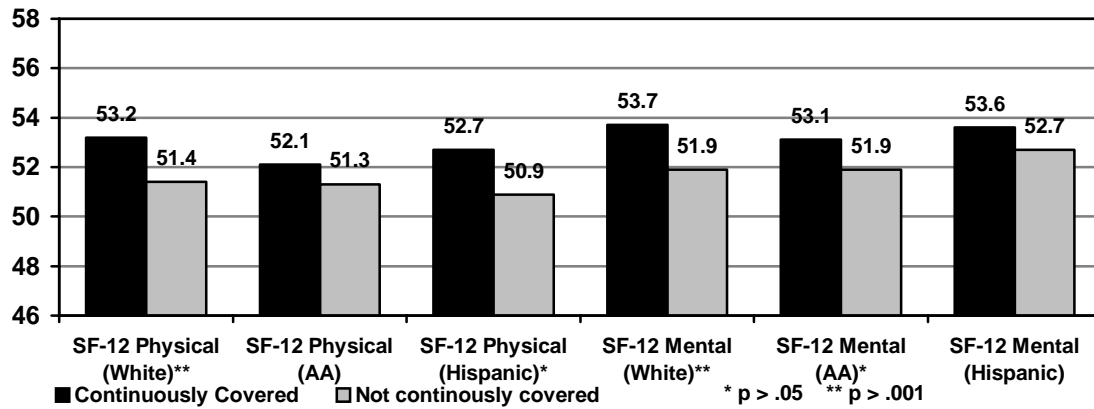
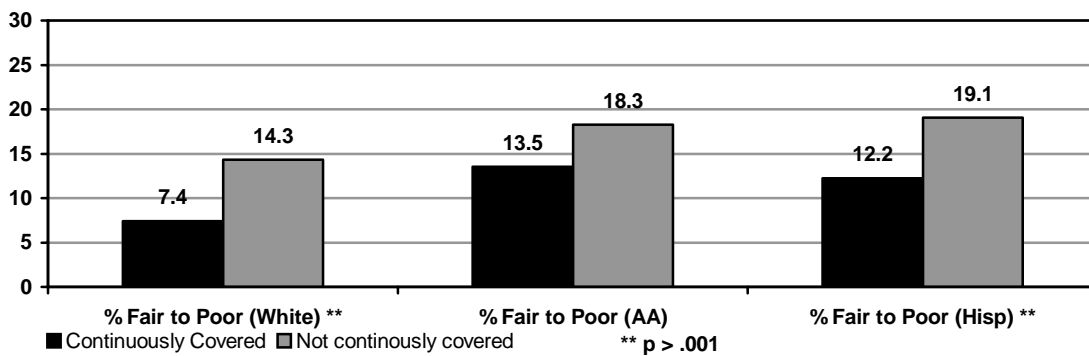


Figure 6. Self-Reported Fair to Poor Health Status at Age 40, by Race/ethnicity and Health Insurance Coverage.



Average BMI and the proportion of persons who were overweight or obese differed across race/ethnicity groups, but did not differ by coverage status within any race/ethnicity category. Thus, whites had the lowest average BMI and the smallest proportion of persons who were overweight or obese, but within white respondents, insurance coverage did not affect BMI. Similarly, the proportion of persons reporting hypertension or diabetes differed across race/ethnicity groups, but within a specific group, duration of insurance coverage had no additional effects. The proportion of respondents reporting hypertension was highest among

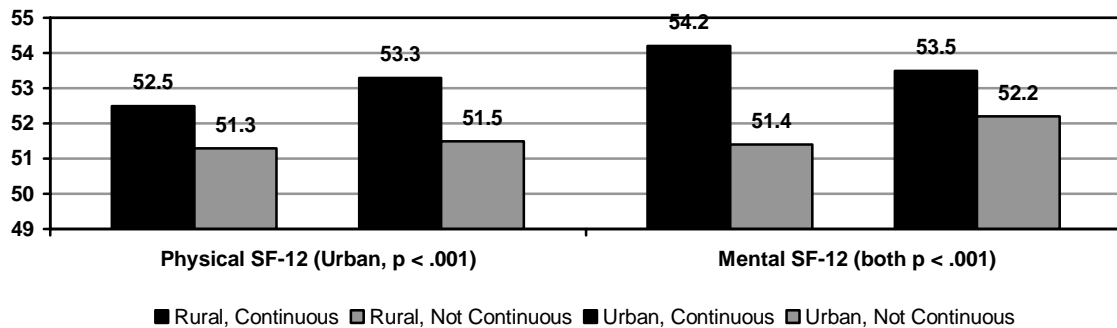
African Americans (20.4%-24.4%); the proportion with a diabetes diagnosis was highest among Hispanics (8.0%-8.8%).

Health Outcomes by Residence and Health Insurance Coverage

When characterizing respondents as “rural” or “urban,” we dichotomized the study population, as noted earlier. Persons were defined as “rural” if they had lived $\geq 50\%$ of the years from 1989 through 1998 or 2000 outside metropolitan areas, and urban in all other cases (Table B-5). While this definition is extremely broad, a tighter definition of rural yielded too few persons for analysis of outcomes for minority populations. Health outcomes were tested between people who were continuously covered and those who were not.

Within residence categories, but not controlling for other respondent characteristics, continuous coverage was associated with significantly higher SF-12 Physical Component scores for urban residents, but not for rural residents (See Figure 7 and Table B-5). The absence of significance among rural respondents appears to stem from the larger differences associated

Figure 7. SF-12 Physical and Mental Component Scores at Age 40, by Residence and Health Insurance Coverage.



with continuous insurance among urban persons. Note that the values for persons lacking continuous coverage are the same among both rural and urban respondents (51.3 and 51.5,

respectively), while the improvement associated with continuous insurance is larger for urban residents (53.3 for urban versus 52.5 for rural respondents). On the other hand, the proportion of respondents reporting “fair to poor” health was nearly twice as high among persons who lacked continuous health insurance coverage (15.7% rural, 15.4% urban) as among the fully insured (8.6% rural, 8.3% urban). Findings from this measure were similar in direction and magnitude across both rural and urban residents and were significant for both groups (Table B-5).

Examining SF-12 Mental Component scores within residence categories but not controlling for other respondent characteristics, scores were significantly higher among continuously insured persons in both urban and rural areas. Further, the effect size was larger among rural residents (a 2.8 point difference) than among urban residents (1.3 point difference; see Figure 7, previous page, and Table B-5).

The other health measures examined by the study, obesity and a reported diagnosis of hypertension or diabetes, did not differ statistically by continuity of insurance coverage.

Holding Personal Characteristics Equal: Multivariable Analysis

The unadjusted analyses looked only at the effects of residence, race, and insurance. However, other personal characteristics affect health, and may vary across the principal variables of interest. The effects of residence, race and insurance, while holding other factors equal, were studied using multivariable analytic models. In developing the modeling approach, we attempted to include only variables that reflected events prior to, rather than simultaneous with, the measurement of self-reported physical health at age 40. Thus, the insurance and residence variables summarize status across the nine to eleven years preceding the interview (1989 through 1998 or 2000). Race, sex, education, marital status, and poverty during youth, are similarly, long-term and/or prior statuses or events. An incremental modeling approach was used. The first

model examined the effects of the principal variables of interest--insurance, residence and race--simultaneously on the relevant health outcome. The second model added sex, marital status, education, and poverty status in 1979 to the preceding variables.

Factors Affecting Physical Health

Two general linear models were fitted for the SF-12 Physical Component scores (Table B-6). Physical health scores for persons who were continuously covered were better than for those who were not (52.8 vs 51.4, $p=0.0001$), adjusting for residence and race. Urban residents had significantly higher scores than rural residents (51.5 versus 52.3, $p = 0.0317$), controlling for insurance and race. Race was not a significant predictor of physical health scores when residence and insurance were held equal.

After adjusting for sex, marital status, education, and poverty in youth, however, physical health scores were no longer associated with continuous health insurance coverage or residence. Education was highly associated with physical health status, with reported physical health increasing with each increase in level of education. Males reported better physical health than females. Married individuals had higher SF-12 physical health scores than did persons who had never married. Persons who were poor in 1979 had slightly lower scores than those who were not in poverty during youth (51.5 vs 52.3, $p = 0.0369$). Physician availability in the individual's present county of residence, when added to model 2, had no significant effects (results not shown).

Factors Affecting Mental Health

The modeling approach used to study SF-12 Physical Component scores was also used to analyze factors associated with SF-12 Mental Component scores (Table B-7). In the first model, which adjusted for residence and race, individuals who had been continuously insured reported better self-perceived mental health than others (mean 53.5 vs 52.7 and 51.8, $p<0.0001$). Mean

mental health scores did not differ with respect to residence or race when insurance status was held constant.

Even when personal characteristics were held equal, individuals who had insurance coverage for less than 75% of the time had worse mental health compared to the other two groups, although the relationship was less strong (mean of 53.2 among continuously insured versus 53.0 for 75%-99% and 52.3 among persons with $\leq 75\%$; $p=0.0161$). Differences for residence or race were not significant. Males (54.3) reported better mental health than females (51.6) and persons who were currently married reported better mental health than those who were never married or in other statuses (mean of 53.3 versus 52.5 and 52.0, respectively; $p = 0.0085$). Education was to be associated with mental health, with persons having at least some college education having better mental health status ($p=0.0051$). Poverty in youth tended to be associated with lower SF-12 mental health scores (52.2 versus 53.1; $p = 0.0520$). In a third model, physician availability was not significantly linked to mental health status at age 40 ($p=0.6937$).

Self Reported Health Status

Logistic regression was used to model whether a person would perceive their health status as “fair” or “poor” (hereafter, poor health) versus better outcomes, using the same incremental modeling approach as above (Table B-8). In a model assessing the simultaneous effects of insurance, residence and race, the odds of poor health were higher for people covered for less than 75% of the time and those covered 75%-99% (OR=1.85 and OR=1.42, respectively) compared to persons who were continuously covered. Even with insurance coverage held constant, the odds of reporting poor health were significantly higher for Hispanics (OR=1.62)

and African Americans (OR=1.61) compared to whites. Rural versus urban residence had no effect.

With personal characteristics held constant, insurance coverage, residence and race were not significantly associated with poor health at age 40. Strong education effects were present. Individuals who had not completed 12th grade, or high school graduates with no further training, were markedly more likely to report poor health than individuals who attended or graduated from college (OR of 4.14 and 2.54, respectively, compared to college graduates; Table B-8). Males were less likely to report fair or poor health (OR=0.75) than females. Marital status and poverty during youth had no statistical effects. Physician availability, when added to model 2, had no significant effects (results not shown).

Diagnoses and Health Risks

Obesity, a health risk variable that is associated with multiple co-morbidities, was studied in a manner paralleling health status. When the effects of insurance, residence and race were examined, rural residents (OR 1.36) and minorities (Hispanic, OR 1.51; African Americans, OR 1.98) were more likely to be obese at age 40 than urban residents or whites (Table B-9). Continuity of insurance coverage was not associated with the risk of obesity.

When individual characteristics were added to the model, the relationship between rural residence and obesity was no longer significant. Race remained significantly associated with obesity, with Hispanics (OR 1.40) and African Americans (OR 1.84) having higher odds than whites. Education was strongly linked to obesity, with persons with less than a college degree being significantly more likely to be obese than graduates. While persons who never married did not differ from married individuals with regard to risk for obesity, persons in the “other” category, those who were widowed, separated or divorced, were significantly less likely to be

obese (OR 0.73). Sex and poverty during youth were not associated with obesity at age 40. When added to the model, physician availability measured by physician rate per 100,000 persons was not significant ($p=0.4685$; results not shown).

There was no association between diagnosis of hypertension at age 40 and insurance coverage; this absence of effect was consistent across race and residence (Table B-10). Rural residents were not more likely than their urban peers to report a diagnosis of hypertension. African Americans were more likely to have a diagnosis of hypertension than were Whites (OR=1.79); but Hispanics did not differ.

When controls for other personal characteristics were introduced in model two, results were similar. Residence and continuity of insurance coverage were not associated with diagnosed hypertension. The odds of hypertension remained higher among African Americans than among whites (OR 1.58), while Hispanics did not differ from whites. No other factors were associated with a diagnosis of hypertension by age 40.

Similarly, continuity of insurance coverage was not associated with a diagnosis of diabetes at age 40; this effect was consistent across race and residence (Table B-11). Rural residents were not more likely to report being diagnosed with diabetes. Hispanics (OR=2.31) and African Americans (OR=1.78) were more likely to report a diagnosis of diabetes than were whites. When personal characteristics were added to the model, insurance coverage and residence still showed no relationship to diagnosed diabetes. The odds of diabetes remained significantly higher among Hispanics (OR 2.22) than among whites, and approached significance among African Americans. (OR 1.55, CI 1.00, 2.41) Males were less likely to report a diagnosis of diabetes (OR 0.58) than were women. None of the other personal factors were significantly related to a reported diagnosis of diabetes by age 40.

Chapter Three

Conclusions and Policy Recommendations

Conclusions

Effects of health insurance on physical health

In a population just reaching age 40, continuous health insurance coverage across the preceding 9 to 11 years was not associated with better self-perceived health, as measured using the SF-12 Physical Component Score. A positive relationship between insurance coverage and health in unadjusted analysis, which remained after controlling for race and residence, ceased to be significant after age, education, marital status, and poverty during youth were held constant. Similar results were found when health status was dichotomized into “fair to poor” versus better self-perceived health. Health insurance was not significantly related to the probability that a respondent would report a high BMI (obesity), or having been diagnosed with hypertension or diabetes. The relationship between insurance and physical health outcomes operated similarly in rural and urban areas and across race/ethnicity categories.

Absence of the anticipated relationship between continuous insurance coverage and physical health at age 40 may have multiple causes. First, respondents were aged 29 - 31 at the beginning of the period studied. Previous longitudinal research into the effects of intermittent insurance has focused on older populations, such as the persons aged 51 – 61 at baseline followed by the Health and Retirement Survey (Sudano and Baker, 2003; Johnson and Crystal, 2000) or the Hispanic Established Populations for Epidemiologic Study of the Elderly (Angel, Angel and Markides, 2002). Persons at younger ages may be less susceptible to disease in general than older populations. Second, the study relied on patient report of diagnosed disease.

Persons who visit a health care provider regularly may be more likely to be diagnosed for hypertension and diabetes, both of which are asymptomatic at early stages. Additional limitations are detailed later in this chapter.

The principal drivers of perceived health status at age 40 were education (higher education was associated with better health), marital status (married reporting better health), sex (males reporting better health), and poverty during young adulthood (ages 19 – 21, associated with poorer health). The latter effect is extremely interesting. Part of the effect of poverty while young may stem from persistent poverty throughout adulthood; as noted, individuals who were poor in 1979 were more likely to be poor in 1998-2000 than were others. Poverty rates were reduced, but not eliminated, as persons first interviewed in 1979 matured. We did not include poverty status at age 40 in the modeling approach, as we wished to avoid the endogeneity issues associated with simultaneous measurement of the potential predictor and the outcome. Beyond the continuation of poverty as a factor relating to poorer health, it is possible that health habits and attitudes formed during youth persist despite subsequent financial improvement. An emerging literature suggests that mortality is affected by childhood social status, in addition to adult status (Poulton, Caspi et al 2002; Pensola and Martikainen, 2004; Beebe-Dimmer, Lynch et al 2004). In an analysis of the National Longitudinal Survey of Older Men, financial status at midlife was found to be more strongly associated with mortality than financial status in later life (Hayward and Gorman, 2004). In addition, research is beginning to link childhood experiences with adult morbidity (Blackwell, Hayward, Crimmins, 2001). Future research exploring duration of time spent in poverty, paralleling the present research exploring time within insurance and time spent in rural regions, is needed.

Effects of health insurance on mental health

While the proportion of time with insurance coverage was not significantly related to five self-reported measures of physical health, continuous insurance coverage was associated with better mental health, as measured by the SF-12 Mental Component Score. While the effect size was small, in multivariable analysis it persisted even after residence, race, and demographic covariates were held constant. Other factors associated with self-perceived mental health paralleled those associated with physical health: sex, marital status, education and poverty during youth. A direct causal relationship between insurance and mental health status cannot be inferred, even though insurance is measured for an extensive period prior to the measurement of mental health, however. The SF-12 Mental Component Score was not administered at the initiation of the survey, in 1979, and thus it is possible that persons with better self-perceived mental health at age 40 possessed that characteristic throughout their adult lives, and that better mental health earlier in adulthood led to employment and other choices that resulted in continuous insurance coverage from 1989 onward.

Effects of rural residence

Among persons with similar coverage, the relationship between health insurance coverage and physical and mental health outcomes was not affected by residence. Among both urban and rural residents, persons lacking continuous insurance reported lower SF-12 physical health scores, although the relationship was not statistically significant among rural respondents. The proportion of persons reporting fair to poor health status was statically higher for persons without continuous health insurance coverage among both urban and rural residents. In

multivariate analysis, however, the effects of rural residence on self reported physical and mental health were not significant after other personal characteristics of respondents were held equal.

While the effects of insurance did not differ between rural and urban respondents, it is worth noting that many risk factors associated with poorer health status, such as low education levels and poverty, have been found to be more common in rural populations (Glover, Moore et al, 2004).

Effects of Minority Status

With differences in insurance coverage, residence, education, marital status, age, and poverty in young adulthood held constant, neither African Americans nor Hispanics in the study perceived themselves to have poorer physical or mental health than whites. The only significant differences that emerged pertained to obesity, a risk factor, and hypertension and diabetes, diagnoses associated with obesity. As expected, obesity and diabetes were more common among both African Americans and Hispanics than among whites (Tables 4, 8 and 10). For diabetes, race/ethnicity was the only predictive factor that was significant in multivariable analysis (Table 10). Hypertension was more likely among African Americans than whites, but odds did not differ for Hispanics. Findings regarding increased prevalence of diabetes and hypertension among minorities reflect national trends for these populations (Lucas, Schiller and Benson, 2004; Mensah, Mokdad, Ford, Greenlund and Croft, 2005).

It is interesting that although the presence of diagnosed disease was significantly higher among minority respondents, they did not report lower levels of physical health, other factors held equal. These results may be due in part to the relatively young age of respondents. The oldest individuals in our sample were 40. Thus, more serious health complications have likely not yet emerged, even among persons with diagnosed disease.

Effects of Education

In light of continuing debates on the adequacy of state funding formulas that allocate resources to rural schools, it is worthwhile examining the effects of education on health at age 40. Educational attainment, measured in four increments from less than high school through college graduation or above, was not significantly related to the two specific diagnoses studied, diabetes and hypertension, in adjusted analyses. However, it was strongly related to the risk of being obese. Further, self-perceived physical and mental health scores increased steadily with education. The effect on self-reported 'poor to fair' health status was striking. The odds that an individual who did not graduate from high school would report poor health at age 40 were 5.42 times higher than those of college graduates. Increased education may be associated with occupations less likely to cause physical stress and strain, with increased self-care skills, or simply with different definitions of expected health.

Health Insurance Coverage

While examining the effects of health insurance was the principal purpose of the study, levels of insurance observed in the population are also worth discussing. Over the 1989 – 1998/2000 period, only slightly more than a third of rural minority respondents (37%) were continuously insured. While whites were more likely to be continuously insured (57%) than minorities, the proportion is both objectively low and statistically lower than among urban whites.

The absence of health insurance does not appear to have had adverse effects on the respondents' self-perceived physical health at age 40. However, low rates of coverage are likely to continue as the cohort ages. A recent analysis of insurance coverage for the period 1992 – 2000 among older adults (51 – 57 at baseline) found that 21.8% were uninsured at one or more

of five survey administrations across the period (Baker, Sudano, 2005). Further, minorities were at higher risk than whites for both a single uninsured period and, particularly, for being uninsured at two or more survey administrations. Rising premiums are projected to increase over the next 10 years, potentially further exacerbating gaps in coverage (Gilmer, Kronick, 2005). Thus, as the NLSY study population ages, disparities between insured and uninsured populations, and across racial/ethnic groups, may be anticipated to worsen.

Limitations to the Present Analysis

The analysis performed for this report is innovative. To the best of our knowledge, no previous researchers have explored materials from the National Longitudinal Survey of Youth initiated in 1979 to ascertain effects on health of exposures such as insurance coverage and rural residence. However, the initial research on a topic makes assumptions and creates definitions that may be improved by subsequent work. Limitations to the present analysis include:

- Defining rural residence. Several limitations surround the way “rural” was defined. Although the degree to which the US population as a whole is “mobile” has been questioned (Wolf and Longino, 2005), very few persons remained in non-metropolitan settings for the approximately 9-11 years they were studied. Therefore, we chose to express residence as a proportion of time, and to dichotomize at the 50% point. Both the use of percentages and the specific cut-points used can be debated. A definition of “rural” that was restricted to persons living exclusively in rural areas would be theoretically more powerful. However, in the dataset used, the small “completely rural” population would have meant less power for the analysis. An additional limitation is caused by the absence of further delimitations within “rural.” The health status of an individual who spends early adult life in a frontier area may

differ from that of a person living in a large rural county with significant urbanized populations.

- Defining insured. Parallel limitations are present in the definition of coverage. While the analysis specifies percent of time insured between 1989 and 1998/2000, it does not distinguish between persons whose period of uninsurance was early in the study period and those for whom it might have been recent, or between a single extended period of uninsurance and multiple such periods. However, the definition of “continuous coverage” is fairly straightforward, and the time span covered is greater than that used by previous research. Second, the report does not distinguish between private and public insurance coverage. Several previous studies have shown that adults with public health insurance generally have poorer health status than the privately insured, and may have transferred from private insurance of an uninsured state in response to such poor health (Baker and Sudano, 2005). Grouping these two categories may have obscured differences in health between the privately insured, assumed to have better health than the composite group, and those lacking insurance coverage. The modeling approach may also be a limitation. “Continuous coverage” was used as the referent group. Different effects may have been reached had we used the small group of persons who never had insurance at any time. Later analyses, as more of the NLSY-79 cohort reach age 40, may be able to employ this approach.
- Age of respondents. As noted earlier, age 40 is relatively young, as far as the health effects of chronic disease are concerned.
- Outcomes. All health outcomes used in the study are based on respondent self-report, even though two are drawn from recognized instruments. Absent clinical

examination, an objective assessment of health status cannot be obtained. The most likely result is that the true prevalence of disease in the population is under-estimated.

Policy Recommendations

Although health insurance, in the present analysis, was not related to most measures of physical health status once demographic and socioeconomic variables were taken into account, we are reluctant to conclude that health insurance is not necessary, or not needed until individuals reach older ages. It seems likely that the individuals examined in this study were too young for major adverse health events and major declines in health to occur. Nearly half (46%) of the population studied here did not have continuous insurance coverage between the ages of 29-31 and age 40. If NLSY respondents reacted to insurance gaps as did individuals in previous research, they are likely to have deferred routine care during their period without insurance (Sudano, Baker 2003), or to have problems meeting medical expenses (Schoen, DesRoches 2000) and to have sought public insurance or charity care when hospital care was needed (Johnson, Crystal 2000). Further, the population studied will continue to be at risk for gaps in health insurance coverage as they age (Baker and Sudano, 2005)

Mental health was the only condition that was significantly related to continuous health insurance coverage. This is an important finding: mental health has the second largest burden of disease in most market economies including the U.S., second only to cardiovascular diseases (NIMH, 2001). Although there has been little research on the costs of mental illness, it is assumed that the direct and indirect costs associated with mental illness, treatment, and recovery are severe. Missed work, inability to carry out daily tasks, long treatment periods and expensive care all contribute to the cost of mental illness. The Mental Health Parity Act of 1996 (MHPA) may have contributed to the association between continuous insurance coverage and improved

mental health. Since 1998, companies with 50 or more employees have had to offer comparable benefits for mental health and physical health if they offered coverage for mental health services (CMS 2005). Despite the many loopholes written into the MHPA, its extension from the year 2000 into 2004 indicates that lawmakers and administrators perceive that the law has had some success in improving mental health coverage. Given the link between mental health status and continuous insurance coverage found in this study, future research should try to quantify the impact of the MHPA on the extent of coverage for mental health services and use of mental health services.

Although there were no significant differences between rural and urban adults in the effect of continuous insurance on health status, it is interesting to note that rural residents overall were less likely to be continuously insured than urban residents. In addition, rural minorities were particularly disadvantaged with respect to having continuous insurance coverage. Given our continuing belief that insurance will play a significant role in improving health status as these individuals age, programs that target improved insurance coverage and access to care among rural residents, especially minorities, will continue to be needed. In Andersen's Behavioral Model, health insurance is an enabling factor that can improve health status by reducing financial barriers to accessing care. However, as discussed below, the difficulty of expanding insurance coverage makes other methods of improving access equally important.

Expanding Medicaid coverage is not a viable option at this time. First, the FY2006 Federal Budget recently passed by Congress calls for a reduction in the Federal contribution to Medicaid (Abrams, 2005). Under the budget resolution, \$10 billion would be cut from Medicaid over the 2007 – 2010 fiscal years. Even before the new Federal budget stance, many states were facing budget crises that threaten existing coverage and have implemented or plan to implement

cost containment policies (Smith, Ramesh, Gifford, Ellis, Rudowitz & O'Malley, 2004). From 2002 to 2004, states exercised a variety of cost-control options, from reducing eligibility and benefits and increasing co-payments on the demand side, to reducing or freezing provider payments and controlling drug costs on the supply side. These same strategies are being considered by other states for FY 2005. Enrollment in Medicaid has continued to grow based on existing eligibility standards, while state tax revenue has grown at a much slower rate than growth in Medicaid costs (Smith, Ramesh, et al, 2004).

Mental health care presents additional problems, particularly as regards a rural mental health safety net (New Freedom Commission, 2004). For a variety of reasons, including managed care, downsizing, consolidation, and state budgetary constraints, inpatient hospitalization and residential treatment decreased demonstrably during the 1990s. This paradigm shift has resulted in persons with persistent and severe mental illness being treated in community-based settings, such as Community Mental Health Centers. With Community Mental Health Centers caring for more persons with high levels of acuity, individuals with less severe conditions, such as persons in the current study, are not treated due to the capacity issues.

Overall, programs that target expanded access to the uninsured without changing their insurance status may offer the most feasible solutions to the provision of physical and mental health care. The United States' health policy works through incremental reform (Short, Shea, Powell, 2003); therefore, it would be most productive to encourage planners to think of short-term approaches that can fill gaps, as well as more over-arching solutions (Short & Graeffe, 2003). However, it should be noted that communities most in need of services often lack strong safety net institutions, and thus are unable to compete successfully for grant funding (Hoadley, Felland and Staiti, 2004).

Recommendation: The Department of Health and Human Services should evaluate how its component agencies can best support local programs working to improve access to care for uninsured populations. Working with professional organizations, including the American College of Healthcare Executives, the American Hospital Association, and the National Rural Health Association, DHHS should ensure that best practices among such local efforts are identified and shared. Technical assistance materials developed to document best practices should be available to, and understandable by, non-specialist community leaders.

Federally Qualified Community Health Centers (CHCs) and Rural Health Clinics

(RHCs): CHC's and RHCs may offer an option for expanding access to health care to rural residents without changing their insurance status. CHCs have grant support that allows them to charge sliding scale fees to uninsured persons. However, awareness of this program among the general public may be limited. At present, RHCs receive expanded reimbursement for Medicare and Medicaid patients, but receive no specific support to help them address the needs of un- and under-insured patients. Local collaborations and referral arrangements between CHCs and RHCs offer one potential means of directing uninsured persons to a low-cost source of care.

Recommendation: The Secretary of the Department of Health and Human Services should work with the National Association of Rural Health Clinics, the National Rural Health Association, and the National Association of Community Health Centers to define model approaches to involving RHCs in the care of uninsured persons. It would be particularly valuable to document collaborations among RHCs, CHCs, and other service providers, and to communicate the information broadly to state and local planners.

Rural Practitioner Skills. The decreased mental health reported by respondents who lacked continuous health insurance was not sufficiently severe as to result, for example, in prolonged hospitalization that might have led them to drop out of the survey. Nonetheless, recognition of problems by health care providers might have alleviated distress. Because expansion of mental health safety net services through additional mental health practitioners is not feasible in all areas, ensuring that primary care providers are knowledgeable offers a short-term solution. Training resources could be offered to state medical societies for use in continuing medical education programs.

Recommendation: In partnership with local mental health professional organizations, Area Health Education Consortia are encouraged to develop strong educational programs in mental health screening, treatment, and referral for family medicine, internal medicine, and general surgery resident physicians, and for nurses. Such educational content is needed both during practitioner training and as part of continuing medical education programs.

Improving practitioner pipelines. Educational attainment was strongly related to all health outcomes. The health insurance status of individuals possibly improved, and the pipeline of future practitioners enhanced, through efforts to recruit a broad range of individuals into health careers. Re-education, such as that provided through the Workforce Investment Act of 1998 (WIA), can serve as a mechanism for addressing current low income, uninsured persons by allowing them to enter careers with better prospects for pay and benefits. A recent study of programs funded by the WIA found that multiple states were using the program to develop health careers, both among youth and among low-income adults (Skillman et al, 2005)).

Recommendations:

- State Area Health Education Consortiums are encouraged to partner with local middle and high schools in an attempt to promote health careers, both as a means of encouraging children to higher educational attainment and as a way of growing a local health labor force. Such activities should be particularly promoted in rural areas.
- State Area Health Education Consortiums are encouraged to partner with agencies in their state responsible for implementation of the WIA, in order to identify health careers job training opportunities that may benefit rural residents and institutions.

Research Recommendations

Research recommendations flow directly from the findings, and the limitations, of the present study:

- The youngest members of the NLSY-79 cohort reach age 40 in 2005. When public use data are available for the full NLSY-79 cohort, the analysis reported here should be repeated. With larger sample sizes, many limitations of the present analysis may be obviated.

For example, more detailed definitions of “rural” and “insured” will be possible.

- Poverty at ages 19 – 21 appears to have lasting effects on perceived mental and physical health, even controlling for education and health insurance. This long-term effect may result from culture as learned in youth, from employment choices, or from other factors not included in the present analysis. Identification of factors which ameliorate the effect of early

poverty, which may include education, employment in varying occupations, and so on, is essential.

Appendix A: Methods

The National Longitudinal Survey of Youth

The National Longitudinal Survey of Youth (NLSY-79), commissioned by the Bureau of Labor Statistics, is one of the nation's longest running panel surveys (NLSY79, 2001). A multistage, stratified clustered sample, it was initiated in 1979 with three components: a sample representative of the population of persons born between 1957 and 1964; supplemental samples of African Americans, Hispanics, and economically disadvantaged whites; and a sample of active duty military. The latter two groups, military and disadvantaged whites, were dropped from follow-up after 1990.

Participants were interviewed annually from 1979 through 1994, and biannually until present, with an 84% retention rate through 1998. Retention rates do not differ by race. In all except one survey round (1987), most interviews were conducted in person, with some individuals who were difficult to reach interviewed by telephone. A Spanish version of the questionnaire was developed and was used if the respondent requested it.

While principal focus of the NLSY has been labor and economic outcomes, information about life experiences (marriage, residence) and health were also obtained. An additional survey (NLSY79 Children) has tracked growth and development among children of the originally sampled individuals.

Throughout the years, information on the health of each participant has been collected to ascertain the individual's fitness for labor force participation. This information has included height, weight and health conditions that would prevent the person from being active in the labor market. Beginning in 1998, as the first group of the cohort reached the age of 40, an additional section was added to the interview that addressed respondent health. This section included the mental health and physical health components of the SF-12 along with self-reported health status and other health outcomes measures.

The analysis presented in this report is limited to the subset of NLSY-79 participants (3,137 persons) who had reached the age of 40 by 2000 and had less than 3 missing interviews between 1989 and 2000, the most recent administration of the NLSY-79 available in a public-use data set. For this subset of individuals, we examined information from all administrations of the

NLSY from the initial survey through the survey year in which respondents turned 40 and received the health interview. The outcomes studied were the measures of health status used by the NLSY: self-reported health status, SF-12 physical and mental component scores, body mass index (BMI), and a reported diagnosis of hypertension or diabetes.

Insurance Status

From 1979 on, respondents were asked if they received health insurance as an employee benefit. However, a “no” answer to this question does not imply that the respondent was uninsured, as insurance may be privately purchased or the respondent could be covered under a spouse’s policy. Further, the question was not asked of respondents who were not in the work force at the time of the interview. Thus, women who were temporarily out of the workforce to care for children would have been excluded. In 1989 and subsequently, the insurance questions were expanded to ask the respondent explicitly about his or her coverage. Respondents were asked annually (biannually after 1994) whether they were insured at the time of the interview. Thus the NLSY-79 data set, with 7-8 observation points across 12 years, provides substantial historical information about insurance coverage, allowing us to examine current health conditions in light of previous, rather than simultaneous, insurance coverage. The specific NLSY-79 questions used for the present study to define coverage are in the table below.

Table A-1. Source questions for insurance variable		
Year	Question	Response
1989	Who is covered by a health/hospitalization plan (respondent)	Respondent
1990	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No
1992	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No
1993	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No
1994	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No
1996	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No

1998	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No
2000	Are you covered by any kind of private or government health or hospitalization plans or health maintenance organization (HMO) plans?	Yes/No

We created a measure indicating the percentage of coverage an individual had across the 10-12 year period by summing up the number of years with a ‘Yes’ response to the above questions and then dividing by the number of years surveyed. Participants were not included in the analyses if a respondent had missing responses for 3 or more years. For those persons with 1 or 2 missing responses, imputation was used for the missing values using a random binomial number generator in SAS (Cary, NC).

Residence

In a mobile society, determining the effects of rural residence over a 20-year period is not straightforward. Across the study population, from 34% (whites) through 16% (Hispanics) of respondents were living in rural areas, defined as outside standard metropolitan areas, in 1979. By 2000, the last survey year, these values had dropped to 10% for whites and less than 4% for Hispanics. Further, a substantial portion of NLSY participants moved during the study period.

Because we were examining the effects of insurance over time, we similarly defined “rural residence” as a function of time. For each individual, we calculated the percentage of time spent outside a standard metropolitan area. For dichotomous analyses, we defined “rural resident” as a person who had lived less than half of the studied period in an urban area.

Health Status

Several health outcomes were studied. The first set of measures was scores from the Short Form 12 (SF-12) survey, Physical Component Scores (PCS) and Mental Component Scores (MCS). These scores can range from 0-100 and are designed to have a mean value of 50 in a representative US population (Ware, 1996).

Self-reported health status was also used as an outcome, based on a question within the SF-12. Respondents could describe their own health as Excellent, Very Good, Good, Fair or

Poor. Responses were grouped into two categories, Excellent, Very Good or Good versus Fair or Poor.

Body mass index (BMI) was considered a health outcome and was analyzed as both a continuous variable and as a dichotomous variable. Obesity was defined as having BMI greater than 30.

The NLSY-79 health survey asks respondents whether they have experienced an extensive list of conditions, from cancer and congestive heart failure through allergies. In determining which of these conditions to use, we focused on conditions generally believed to be preventable through primary care, excluding diagnoses such as cancer for which the etiology is less well known. In addition, we limited the analysis to conditions with sufficient prevalence in the study population for adequate analysis. This removed from consideration conditions such as stroke and congestive heart failure, which have very low frequency in a population aged 40. The specific conditions selected for analysis were hypertension and diabetes, which could in many cases be avoided through preventive counseling regarding weight control, diet, and exercise, but which occurred frequently enough for analysis. Smoking status was not used as an outcome for the study because the questions from 1998 and 2000 were not similar and could not be combined. In 1998, a question was asked pertaining to smoking daily, occasionally, or not at all. In 2000, smoking questions were only addressed to women who had been pregnant.

Other Determinants of Health Outcomes

In addition to insurance coverage and area of residence, resources in the community in which a respondent was currently living could affect his or her health outcomes. Persons with poor availability of health care resources, or living in a generally poor community, may not receive health care that equals that of residents in richer communities. To capture the effects of current resources on health, we included a measure for number of physicians per 100,000 persons (1998 or 2000). We also examine unemployment rate in the county of residence, but it proved to have no relationship to any outcomes.

Statistical Methods

In original 1979 sample, Hispanic and Blacks were over-sampled therefore weights would need to be applied for analyses that summed across race/ethnicity. For descriptive percentages, we stratified by race and rural, providing no estimates for the total population. Therefore, no sampling weights were needed.

Sampling weights from a specific year (1998 or 2000) were applied only when the analyses were not stratified by race. For all modeling, we controlled for race/ethnicity (sampling strata) and took into account design effects from the original sample design in 1979.

Chi-square analyses were used to compare percentages of demographic variables across races, to compare percentages of race and residence across coverage, and to compare percentages of categorical health outcomes by race, residence, and coverage. Means and standard errors were presented for SF-12 scale components, physical health and mental health. Means were tested for differences using analysis of variance (ANOVA).

Logistic regressions were used to determine the odds of having defined categorical health outcomes (Fair to Poor health status, obesity, hypertension, and diabetes). Because of the continuous nature of both the SF-12 physical component and mental component scores, these scores, used as dependent variables, were analyzed again using general linear modeling. This allowed estimating the least squares means for each level of the independent variables.

All modeling started with a model where the outcome was predicted by health insurance coverage as a 3 level variable (100% coverage, 75-99% coverage, >75%), race (White, African American, Hispanic), residence (>50% in urban, >50% in rural), and two interaction terms, one between insurance and race and the other for insurance and residence. These allowed us to test if the effect of insurance coverage on the health outcomes differed by residence or by race. Once the significance of the interactions was determined, the next model included other control variables, sex, marital status, education, and poverty status in 1979. A third model was run to assess the effects of physician availability, measured at the time the health survey was conducted (1998 or 2000). Because this variable was generally not significant, and did not substantially change values for other variables in the model, results are not shown.

Appendix B: Tables

Table B-1. Description of Population, Health Interview at Age 40

N=3,104	Hispanic n=571	Black n=964	White n=1569	Chi- square p-value
	% (SE)	% (SE)	% (SE)	
Female	51.8 (1.9)	53.8(1.9)	53.3 (1.3)	0.7270
Education				0.0000
Less than 12 th Grade	22.8(1.8)	15.2 (1.5)	7.7 (0.8)	
High School Graduate	37.3 (2.4)	43.9 (1.8)	43.1 (1.6)	
Some College	26.4 (1.9)	27.1(1.7)	23.7 (1.2)	
College Graduate or Greater	13.5 (1.5)	13.7 (1.3)	25.5 (1.6)	
Marital Status				0.0000
Never Married	14.7 (1.7)	32.9 (1.7)	9.4(0.8)	
Currently Married	60.9 (2.0)	36.5 (1.8)	72.5 (1.0)	
Other	24.3 (1.8)	30.5(1.5)	18.0 (0.9)	
In Poverty in 1979	28.8 (2.2)	38.9 (2.3)	9.9 (0.8)	0.0000
In Poverty at age 40	15.2 (1.8)	24.8 (1.5)	7.5 (1.0)	0.0000
Residence: Percent Time in SMSA				0.0002
0-25%	6.7 (2.0)	12.1 (3.7)	20.3 (2.9)	
>25% - 50%	1.4 (0.5)	1.9 (0.4)	4.5 (0.6)	
>50% - 75%	6.8 (2.5)	5.2 (1.8)	6.4 (1.2)	
> 75%	85.1 (3.3)	80.8 (4.0)	68.8 (3.1)	
Point residence estimates:				
Not in SMSA 1979	16.1 (4.7)	25.9 (5.4)	34.6 (4.5)	0.0158
Currently Not in SMSA (1998 or 2000)	3.5 (0.9)	5.2 (1.3)	9.8 (1.1)	0.0001
County of residence, 1998 or 2000				
MD population rate (per 100,000)	240.1 (12.1)	307.2 (15.4)	226.2(8.3)	0.0000
Unemployment rate in county of residence	6.3 (0.5)	4.5 (0.1)	4.3 (0.2)	0.0003

Table B-2. Distribution of health insurance coverage by race, residence (1979 and current), and residence over time.

	Continuously covered	Coverage 75 – 99%	Coverage 50 – 74%	Coverage 25-49%	Coverage 0 – 24%
	%(SE)	%(SE)	%(SE)	%(SE)	%(SE)
Total	53.6 (1.3)	14.8 (0.7)	14.9 (0.8)	9.7 (0.6)	7.0 (0.6)
Race*					
White	63.9 (1.5)	12.2(0.9)	10.3 (0.9)	8.1 (0.8)	5.5 (0.7)
Black	43.2 (1.8)	18.3(1.4)	19.1 (1.3)	10.9 (1.0)	8.2 (0.8)
Hispanic	42.9 (2.0)	15.9(1.5)	19.8 (1.9)	11.9 (1.4)	9.5 (1.5)
Residence baseline ^a					
Rural	57.7 (2.3)	13.8 (1.4)	11.1 (1.2)	8.7 (1.4)	8.7 (1.5)
Urban	61.1 (1.7)	12.8 (0.8)	12.1 (0.9)	8.8 (0.8)	5.2 (0.6)
Current residence ^a					
Rural	56.4 (3.3)	15.6 (2.6)	12.4 (2.3)	8.5 (2.1)	7.1 (2.1)
Urban	60.1 (1.5)	13.1 (0.7)	12.4 (0.8)	8.8 (0.7)	6.0 (0.6)
Residence (% urban)					
0 - 25%	56.1 (3.3)	15.2 (1.8)	11.3 (1.6)	9.3 (1.7)	7.9 (1.8)
26-50%	50.9 (5.9)	9.5 (3.5)	17.4 (4.1)	11.9 (3.4)	10.2 (3.4)
51-75%	45.4 (4.3)	10.5 (2.3)	19.3 (3.2)	13.5 (3.6)	11.3 (2.4)
76-100%	62.3 (1.5)	13.3 (0.8)	11.4 (0.9)	8.0 (0.7)	5.1 (0.5)

^a For people turning 40 in 1998, sampling weight is from 1998; for people turning 40 in 2000, sampling weight is from 2000.

P values for non-significant comparisons:

Residence baseline p=0.2652,

Current residence p=0.7813.

* p <0.0001

** p=0.0012

Table B-3. Outcomes by health insurance coverage*, **

	Continuously covered (54.0%; n=1694)	Coverage 75 – 99% (14.6%; n=458)	Coverage 50 – 74% (14.7%; n=462)	Coverage 25-49% (9.7%; n=303)	Coverage 0 – 24% (7.05%; n=220)
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
SF-12 Physical Component	53.1 (0.2)	51.7 (0.4)	51.5 (0.5)	51.2 (0.6)	51.1 (0.7)
SF-12 Mental Component	53.6 (0.2)	52.6 (0.4)	51.0 (0.6)	51.8 (0.6)	52.9 (0.6)
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Fair to Poor Health	8.3 (0.8)	13.5 (1.9)	16.1 (2.0)	16.7 (2.4)	17.0 (3.6)
BMI					
% Overweight	36.7 (1.4)	37.2 (2.9)	36.7 (3.3)	29.2 (3.1)	36.1 (4.0)
% Obese	25.9 (1.3)	28.2 (2.4)	28.6 (3.1)	30.7 (3.1)	22.9 (3.6)
HTN Diagnosis	13.7 (0.9)	16.8 (1.9)	20.4 (2.4)	12.0 (2.1)	16.1 (3.3)
Diabetes Diagnosis	4.0 (0.5)	4.1 (1.1)	6.6 (1.3)	3.2 (1.1)	2.2 (1.1)

*For people turning 40 in 1998, sampling weight is from 1998; for people turning 40 in 2000, sampling weight is from 2000.

**P-values, measuring overall differences across the five coverage categories:

SF-12 Physical Component p=0.0002;

SF-12 Mental Component p=0.0000;

Fair to Poor Health p=0.0001;

BMI p=0.3007;

Hypertension p=0.0855;

Diabetes p=0.1395.

Table B-4. Health Insurance and Health Outcomes Stratified by Race

N=3,137	Hispanic n=575		Black n=963		White n=1,599	
	Not Continuous	Continuous Coverage	Not Continuous	Continuous Coverage	Not Continuous	Continuous Coverage
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
SF-12 Physical Component	50.9 (0.5) ^A	52.7 (0.5)	51.3 (0.4)	52.1 (0.4)	51.4 (0.4) ^A	53.2 (0.3)
SF-12 Mental Component	52.7 (0.5)	53.6 (0.5)	51.9 (0.4) ^B	53.0 (0.4)	51.9 (0.4) ^B	53.7 (0.2)
BMI Mean (SE)	28.5 (0.3)	28.3 (0.4)	28.9 (0.3)	29.7 (0.3)	27.0 (0.3)	26.9 (0.2)
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Self-reported Health Status: Fair to Poor	19.1 (1.9) ^C	12.2 (1.7)	18.3 (1.8) ^C	13.5 (1.7)	14.3 (1.5) ^C	7.4 (0.9)
BMI						
% Overweight	41.1 (2.6)	39.9 (2.8)	37.5 (2.2)	36.2 (2.5)	32.8 (2.4)	35.7 (1.6)
% Obese (BMI ≥30)	32.7 (2.6)	30.3 (2.9)	36.5 (2.0)	40.7 (2.6)	25.4 (1.9)	24.3 (1.4)
HTN Ever Diagnosed	14.8 (1.9)	13.5 (2.2)	24.5 (1.5)	20.5 (1.7)	14.9 (1.7)	13.1 (1.1)
Diabetes Ever Diagnosed	8.0 (1.5)	8.2 (1.8)	6.6 (1.2)	6.0 (1.1)	3.5 (0.7)	3.7 (0.6)

^A Hispanic Not Continuous vs Continuous p=0.0135; White Not Continuous vs Continuous p=0.0001

^B Black Not Continuous vs Continuous p=0.0349; White Not Continuous vs Continuous p=0.0000

^C Hispanic Not Continuous vs Continuous p=0.0073; Black Not Continuous vs Continuous p=0.0612; White Not Continuous vs Continuous p=0.0001

Table B-5. Health Insurance and Health Outcomes Stratified by Residence

	Rural ≥ 50% n=607			Urban ≥ 50% n=2530		
	Not Continuous	Continuous Coverage		Not Continuous	Continuous Coverage	
	Mean (SE)	Mean (SE)	p-value	Mean (SE)	Mean (SE)	p-value
SF-12 Physical Component	51.3 (0.6)	52.5 (0.5)	0.1701	51.5 (0.3)	53.3 (0.3)	0.0000
SF-12 Mental Component	51.4 (0.6)	54.2 (0.4)	0.0000	52.2 (0.3)	53.5 (0.2)	0.0005
BMI Mean (SE)	27.7 (0.5)	28.1 (0.4)	0.5009	27.5 (0.2)	27.0 (0.2)	0.0593
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Self-reported Health Status: Fair to Poor	15.7 (2.7)	8.6 (1.9)	0.0176	15.4 (1.4)	8.3 (0.9)	0.0000
BMI						
% Overweight	33.1 (4.0)	37.7 (3.4)	0.2440	35.8 (1.8)	36.5 (1.6)	0.1703
% Obese (BMI ≥30)	28.7 (3.7)	32.2 (2.9)		27.8 (1.5)	24.5 (1.4)	
Hypertension Ever Diagnosed	15.2 (2.1)	15.2 (2.0)	0.9702	17.2 (1.5)	13.3 (1.1)	0.0544
Diabetes Ever Diagnosed	2.6 (1.2)	4.8 (1.2)	0.2052	4.9 (0.7)	3.8 (0.6)	0.2324

Table B-6. General Linear Model Results for SF-12 Physical Component Scores.

		Model 1*		Model 2**	
		LS Mean (SE)	p-value	LS Mean (SE)	p-value
Insurance Coverage	≤ 75%	51.4 (0.3)	0.0001	51.9 (0.3)	0.1848
	75%-99%	51.4 (0.4)		51.6 (0.4)	
	100% coverage	52.8 (0.2)		52.4 (0.2)	
Residence	>50% in Rural	51.5 (0.4)	0.0317	51.7 (0.3)	0.2069
	>50 % in Urban	52.3 (0.2)		52.2 (0.2)	
Race	Hispanic	51.8 (0.4)	0.0696	52.0 (0.4)	0.8188
	Black	51.8 (0.3)		52.3 (0.3)	
	White	52.5 (0.2)		52.1 (0.2)	
Sex	Male	-	-	52.9 (0.2)	0.0000
	Female	-	-	51.4 (0.2)	
Marital Status	Never Married	-	-	51.3 (0.4)	0.0024
	Married	-	-	52.6 (0.2)	
	Other	-	-	51.5 (0.4)	
Education	<12 th Grade	-	-	49.5 (0.6)	0.0000
	High School Grad.	-	-	51.9 (0.2)	
	Some College	-	-	52.8 (0.3)	
	College Grad. +	-	-	53.5 (0.3)	
Poverty 1979	Not in Poverty	-	-	52.3 (0.2)	0.0369
	Poverty	-	-	51.5 (0.3)	

*Model 1 originally included two interaction terms (insurance and race, insurance and SMSA status). The effect of insurance did not differ by race (insurance * race, p=0.4052) or SMSA status (insurance * SMSA, p=0.6021).

**Model 3 was run with all variables in Model 2 with the addition of unemployment rate and physician rate per 100,000 population. None of the least square means for the variables included in Model 2 changed by more than 0.1. Neither unemployment in the respondent's county of residence at the time of the survey (p = 0.2247) or physician rate was a significant predictor of physical health (p=0.0745).

Table B-7. General Linear Model Results for SF-12 Mental Component Score

		Model 1*		Model 2**	
		LS Mean (SE)	p-value	LS Mean (SE)	p-value
Insurance Coverage	≤ 75%	51.8 (0.3)	0.0000	52.2 (0.3)	0.0161
	75%-99%	52.7 (0.4)		53.0 (0.4)	
	100% coverage	53.5 (0.2)		53.3 (0.2)	
Residence	>50% in Rural	53.0 (0.3)	0.6387	53.0 (0.4)	0.6317
	>50 % in Urban	52.8 (0.2)		52.8 (0.2)	
Race	Hispanic	53.2 (0.4)	0.3713	53.4 (0.4)	0.2592
	Black	52.6 (0.3)		53.0 (0.3)	
	White	52.9 (0.2)		52.8 (0.2)	
Sex	Male	-	-	54.3 (0.2)	0.0000
	Female	-	-	51.6 (0.3)	
Marital status	Never Married	-	-	52.5 (0.4)	0.0085
	Married	-	-	53.3 (0.2)	
	Other	-	-	52.0 (0.4)	
Education	<12 th Grade	-	-	51.4 (0.6)	0.0051
	High School Grad.	-	-	52.7 (0.3)	
	Some College	-	-	53.6 (0.3)	
	College Grad. +	-	-	53.2 (0.3)	
Poverty 1979	Not in Poverty	-	-	53.1 (0.2)	0.0520
	Poverty	-	-	52.2 (0.4)	

*Model 1 originally included two interaction terms (insurance and race, insurance and SMSA status). The effect of insurance did not differ by race (p=0.7860) or SMSA status (p=0.3431).

**A third model was run including all variables in model 2 and the addition of unemployment rate and physician rate per 100,000 population. None of the least square means for the variables included in Model 2 changed by more than 0.1. Neither unemployment in the respondent's county of residence at the time of the survey (p = 0.2772) or physician rate was a significant predictor of physical health (p=0.6937).

Table B-8. Logistic Regression Results for Factors Associated with Self-reported Fair or Poor Health Status

		Model 1*		Model 2**	
		O.R.	95% C.I.	O.R.	95% CI
Insurance Coverage	≤ 75%	1.85	1.44, 2.33	1.29	0.97, 1.73
	75%-99%	1.42	1.08, 1.99	1.14	0.83, 1.58
	100% coverage	1.00	-----	1.00	-----
Residence	>50% in Rural	1.20	0.88, 1.63	0.99	0.73, 1.34
	>50 % in Urban	1.00	-----	1.00	-----
Race	Hispanic	1.62	1.22, 2.15	1.28	0.94, 1.74
	Black	1.61	1.24, 2.10	1.22	0.91, 1.63
	White	1.00	----	1.00	----
Sex	Male	-	-	0.59	0.46, 0.75
	Female	-	-	1.00	----
Marital status	Never Married	-	-	1.36	1.00, 1.55
	Married	-	-	1.00	----
	Other	-	-	1.43	1.07, 1.91
Education	<12 th Grade	-	-	5.42	3.41, 8.51
	High School Grad.	-	-	2.93	2.01, 4.26
	Some College	-	-	1.41	0.93, 2.12
	College Grad. +	-	-	1.00	----
Poverty 1979	Not in Poverty	-	-	1.00	----
	Poverty	-	-	1.37	1.05, 1.79

*Model 1 originally included two interaction terms (insurance and race, insurance and SMSA status). The effect of insurance did not differ by race (p=0.6494) or SMSA status (p=0.6543).

** A third model was run with all variables in Model 2 and, in addition, physician population ratio and unemployment rate in the respondent's present county of residence. None of the least square means for the variables included in Model 2 changed by more than 0.1. Neither unemployment in the respondent's county of residence at the time of the survey (p = 0.6382) or physician rate was a significant predictor of health status (p=0.3122).

Table B-9. Logistic Regression Model Results for Predicting Obesity

		Model 1*		Model 2**	
		O.R.	95% C.I.	O.R.	95% CI
Insurance coverage	≤ 75%	0.93	0.77, 1.13	0.87	0.71, 1.07
	75%-99%	1.05	0.84, 1.30	0.98	0.78, 1.23
	100% coverage	1.00	----	1.00	----
Residence	>50% in Rural	1.36	1.08, 1.71	1.21	0.95, 1.52
	>50% in Urban	1.00	----	1.00	----
Race	Hispanic	1.51	1.22, 1.85	1.40	1.13, 1.74
	Black	1.98	1.64, 2.38	1.84	1.51, 2.25
	White	1.00	----	1.00	----
Sex	Male	-	-	0.95	0.80, 1.13
	Female	-	-	1.00	----
Marital status	Never Married	-	-	1.10	0.87, 1.38
	Married	-	-	1.00	----
	Other	-	-	0.73	0.59, 0.91
Education	<12 th Grade	-	-	1.57	1.10, 2.23
	High School Grad.	-	-	1.66	1.27, 2.16
	Some College	-	-	1.59	1.22, 2.08
	College Grad. +	-	-	1.00	----
Poverty 1979	Not in Poverty	-	-	1.00	----
	Poverty	-	-	1.06	0.85, 1.31

*Model 1 originally included two interaction terms (insurance and race, insurance and SMSA status). The effect of insurance did not differ by race (p=0.1921) or SMSA status (p=0.2175).

**A third model was run with all variables including unemployment rate and physician rate per 100,000 people in the respondent's current county of residence. Neither unemployment rate (p = -/4202) nor physician rate (p = 0.5249) was significant.

Table B-10. Logistic Regression Model Results for Predicting Diagnosis of Hypertension

		Model 1		Model 2**	
		O.R.	95% C.I.	O.R.	95% CI
Insurance Coverage	≤ 75%	1.15	0.92, 1.45	1.04	0.81, 1.34
	75%-99%	1.27	0.99, 1.64	1.19	0.91, 1.56
	100% coverage	1.00	-----	1.00	-----
Residence	>50% in Rural	1.07	0.82, 1.39	0.99	0.76, 1.28
	>50 % in Urban	1.00	-----	1.00	-----
Race	Hispanic	1.01	0.76, 1.36	0.94	0.69, 1.29
	Black	1.79	1.47, 2.19	1.58	1.23, 1.99
	White	1.00	----	1.00	----
Sex	Male	-	-	1.06	0.86, 1.30
	Female	-	-	1.00	----
Marital status	Never Married	-	-	1.18	0.92, 1.51
	Married	-	-	1.00	----
	Other	-	-	0.97	0.24, 1.19
Education	<12 th Grade	-	-	1.47	1.01, 2.14
	High School Grad.	-	-	1.33	1.00, 1.76
	Some College	-	-	1.10	0.78, 1.55
	College Grad. +	-	-	1.00	----
Poverty 1979	Not in Poverty	-	-	1.00	----
	Poverty	-	-	1.07	0.82, 1.54

*Model 1 originally included two interaction terms (insurance and race, insurance and SMSA status). The effect of insurance did not differ by race (p=0.9716) or SMSA status (p=0.3987).

**A third model was run with all variables including unemployment rate and physician rate per 100,000 people in the respondent's current county of residence. Neither unemployment rate (p = 0.7443) nor physician rate (p=0.6645) was significant.

Table B-11. Logistic Regression Model Results for Predicting Diagnosis of Diabetes

		Model 1		Model 2	
		O.R.	95% C.I.	O.R.	95% CI
Insurance Coverage	≤ 75%	0.95	0.67, 1.35	0.91	0.55, 1.39
	75%-99%	1.16	0.72, 1.85	1.12	0.66, 1.88
	100% coverage	1.00	-----	1.00	-----
Residence	>50% in Rural	0.93	0.60, 1.44	0.79	0.49, 1.27
	>50 % in Urban	1.00	-----	1.00	-----
Race					
	Hispanic	2.31	1.51, 3.51	2.22	1.45, 3.41
	Black	1.78	1.23, 2.57	1.55	1.00, 2.41
	White	1.00	----	1.00	----
Sex	Male	-	-	0.58	0.40, 0.85
	Female	-	-	1.00	----
Marital status	Never Married	-	-	1.17	0.67, 2.03
	Married	-	-	1.00	----
	Other	-	-	1.33	0.87, 2.02
Education	<12 th Grade	-	-	1.30	0.69, 2.45
	High School Grad.	-	-	1.29	0.76, 2.17
	Some College	-	-	0.81	0.47, 1.41
	College Grad. +	-	-	1.00	----
Poverty 1979	Poverty	-	-	0.97	0.65, 1.42
	Not in Poverty	-	-	1.00	----

*Model 1 originally included two interaction terms (insurance and race, insurance and SMSA status). The effect of insurance did not differ by race (p=0.7195) or SMSA status (p=0.3791).

**A third model was run with all variables including unemployment rate and physician rate per 100,000 people in the respondent's current county of residents. Neither unemployment rate (p = 0.8628) nor physician rate (p = 0.7998) was significant.

Appendix C: References

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