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ISSN 1525-3066

Center for Policy Research
Working Paper No. 20

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March 2000

$5.00

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Abstract

Although chronically ill individuals need protection against high medical expenses, they often have difficulty obtaining adequate insurance coverage due to medical underwriting practices used to classify and price risks and to define and limit coverage for individuals and groups. Using data from healthy and chronically ill individuals in Indiana, we found that illness decreased the probability of having adequate insurance, particularly among single individuals. Chronic illness decreased the probability of having adequate coverage by about 10 percentage points among all individuals and by about 25 percentage points among single individuals. Preexisting condition exclusions were a major source of inadequate insurance. Our results emphasize the impact of enforcing the Health Insurance Portability and Accountability Act (HIPAA) of 1997, which limits preexisting condition exclusions.

Introduction

Although seriously or chronically ill individuals generally need protection against high medical expenses, they may have difficulty obtaining or maintaining adequate insurance coverage due to the medical underwriting practices health insurers use to classify and price risks and to define and limit coverage for individuals and groups (Field and Shapiro 1993; Stone 1993). Using data from both healthy and chronically ill individuals in Indiana, we examined the effect of health status on three levels of coverage: adequate insurance, underinsurance, and uninsurance. We found that the presence of a chronic illness decreased the probability of having adequate insurance, particularly for single individuals. Chronic illness decreased the probability of having adequate coverage by about 10 percentage points among all individuals and by about 25 percentage points among single individuals. We also found that a key insurance characteristic that influenced adequacy was a permanent preexisting condition exclusion. Such exclusions are now prohibited under most health plans as of 1997 by the Health Insurance Portability and Accountability Act (HIPAA) (Public Law 104-191). Thus, rigorous enforcement of HIPAA will help to promote adequate health coverage for seriously ill people.

Insurance Market Factors Affecting Coverage

Using the Current Population Survey, it was estimated that between 39 and 42 million Americans, representing 17 percent to 18 percent of the non-elderly population, were uninsured in 1996 (Blumberg and Liska 1996). Although the majority of Americans have health insurance, there is considerable variation in the type and extent of coverage (Ginsburg, Gabel, and Hunt

1998; Sullivan and Rice 1991). As many as 16 percent to 19 percent of insured individuals are inadequately insured (or underinsured) with coverage that could leave them exposed to large out-of-pocket expenses in the event of a serious illness (Short and Banthin 1995).

Medical Underwriting Practices

According to an Institute of Medicine Report (Field and Shapiro 1993), the difficulty obtaining or maintaining adequate coverage could result from medical underwriting practices of health insurers that segment less healthy individuals into separate risk pools (Field and Shapiro 1993; Light 1992). Experience rating is one form of medical underwriting in which insurers set premiums and other terms of policies based on characteristics such as age, gender, occupation, and health status (Light 1992). Insurers assume that some employment-based groups are at greater risk of incurring medical expenditures due to the serious illness of one or more employees or due to the overall demographic composition of the group. For such groups, insurers may use experience rating to charge above-average premiums, impose more coverage restrictions, or refuse coverage (Buchmueller 1995). Underwriting practices also include waiting periods, upper limits on the amount that the policy will pay, and exclusions of coverage for certain procedures, test, or drugs (Light 1992). In addition, underwriting practices may result in permanent exclusions of coverage for preexisting health conditions (Buchmueller 1995; Light 1992; Cotton 1992).

Coverage for less healthy individuals may also be reduced by "policy churning," renewal underwriting, and within-group underwriting (Light 1992). Policy churning occurs when a firm switches policies just as the preexisting condition exclusion period ends and the premiums would increase. The firm's new policy costs less than renewing the old policy. However, the new policy contains a new

preexisting condition exclusion period for less healthy employees (Light 1992). With renewal underwriting, potentially costly medical conditions that employees develop are added to the list of conditions that are excluded from coverage under the renewed policy. Finally, within-group underwriting involves singling out less healthy individuals within a group for higher premiums or decreased coverage (for example, a reduced maximum lifetime payout for their illness) (Freudenhiem 1992; Light 1992).

If higher risk individuals are segmented to separate risk pools as a result of medical underwriting practices, they might face restricted coverage, higher premiums, or both (Beauregard 1991; Light 1992; Field and Shapiro 1993; Stone 1993; Buchmueller 1995). Medical underwriting practices resulting in higher premiums may cause individuals to select a lower level of coverage or forgo coverage entirely. Such higher premiums could also cause firms to offer reduced coverage or no coverage at all (Buchmueller 1995; Kolata 1992). Thus, medical underwriting practices may inhibit seriously ill individuals from obtaining adequate health insurance.

Health Insurance Portability and Accountability Act (HIPAA)

In June 1997 the Health Insurance Portability and Accountability Act (HIPAA) (Public Law 104-191) went into effect to mitigate some of the more problematic underwriting practices. Specifically, HIPAA limits an insurer's ability to impose permanent preexisting condition exclusions on individuals who already have health insurance and move to a new group. In addition, HIPAA prohibits charging higher premiums to individuals within a group due to their illness. Consequently, HIPAA may curtail policy churning and some forms of within-group underwriting.

Clearly HIPAA, which assures portability of health insurance from plan to plan and restricts preexisting condition exclusions and other underwriting limits for the chronically ill, is a significant health care reform. However, HIPAA's scope is not complete.

HIPAA does not prohibit the reduction of coverage for specific illness (for example, by lowering maximum lifetime payouts for the illness), nor does HIPAA limit premiums insurers can charge. Moreover, there is evidence that insurers are responding to HIPAA with higher cost health insurance and even avoiding statutory requirements in some cases (Pear 1997; Kuttner 1997). Indeed, President Clinton recently announced an Executive Branch initiative to strengthen federal enforcement of HIPAA (Mohammed 1998). Thus, despite HIPAA, serious or chronic illness might continue to adversely affect the adequacy of coverage, and additional health insurance reform may be warranted.

Defining Adequacy of Coverage

Although much research has focused on the characteristics and numbers of uninsured (for example, Swartz 1997; Blumberg and Liska 1996; Rowland, Lyons, Salganicoff, and Long 1994; Moyer 1989; Short et al. 1988) and the problems the uninsured may face obtaining access to health care (for example, Ayanian, Kohler, Abe, and Epstein 1993; Spillman 1992; U.S. Congress 1992), less research has focused on the adequacy of coverage for insured individuals (Monheit 1994). However, even insured individuals may face major financial problems due to illness (Bodenheimer 1992). Consequently, it is also important to identify individuals who may be inadequately insured.

Previous Research Defining Adequate Coverage

Short and Banthin (1995) estimated the number of individuals with inadequate coverage using the 1987 National Medical Expenditure Survey (NMES). In their study, they placed individuals into a

high-risk group if the individuals' expected medical expenses exceeded the 75th percentile of expenditures in the sample, and they placed the remaining individuals into the low-risk group. Then, they defined the inadequately insured (or underinsured) as individuals whose insurance coverage would not prevent out-of-pocket expenditures from exceeding 10 percent of their annual family income if they faced the average medical expense of individuals with the highest 1 percent of expenditures in their risk group. Using the preceding definition of underinsurance, Short and Banthin found that about 19 percent of the non-elderly insured individuals were inadequately insured.

Short and Banthin (1995) also estimated the percentage of people who were inadequately insured by comparing the actuarial value of individuals' policies with the actuarial value of the Blue Cross and Blue Shield policies offered to federal employees. The actuarial value of each policy in the NMES was calculated as the percentage of total medical expenditures that were covered on average for individuals with a particular policy. When actuarial value of each individual's policy was compared with the actuarial value of the federal employee benefit package (estimated to cover 71 percent of medical expenditures), about 16 percent of insured individuals were underinsured.

In another study, Bashshur, Smith, and Stiles (1993) developed a taxomony of benefit packages. Bashshur et al. divide insurance coverage into four categories: excessive coverage, full coverage, adequate coverage, and underinsurance. Excessive coverage exists when there is redundant coverage for the same services. Full coverage exists when, aside from any premium payments, no additional out-of-pocket payment is required. Adequate coverage exists when some cost sharing is required through deductibles and coinsurance in addition to any premium payments, but the cost sharing does not limit access to needed medical services. Underinsurance exists when the out-of-pocket payments that may be required when an individual faces a medical event interfere with the individual's

ability to obtain needed medical care or if the out-of-pocket payments result in a serious financial burden.

It is important to note that Bashshur et al. measured underinsurance in terms of both insurance characteristics and individuals' perceptions of their coverage. Specifically, insurance is considered inadequate in one or more of the following circumstances: (1) too few services are covered, (2) out-of-pocket expenditures are excessive regardless of family income, and (3) consumers perceive their insurance is inadequate.

Adequacy Defined for the Current Study

To define adequacy of coverage for our study, we have drawn on the taxonomy of benefit packages discussed by Bashshur et al. (1993). Using their scheme, individuals may be uninsured or fall into one of the four insurance categories described above. However, individuals may face financial difficulties due to illness only if they are uninsured or underinsured. Consequently, we have focused on only three groups: the adequately insured, underinsured, and uninsured. Our adequately insured category also includes individuals who were excessively or fully insured in the categorization scheme of Bashshur et al. We have categorized individuals as underinsured rather than adequately insured if they had coverage that could not prevent a medical event from becoming financially catastrophic, requiring substantial out-of-pocket expenditures.

Using Wyszewianski's (1986) definition, a financially catastrophic medical event is different from a high-cost medical event. A medical event is high cost if it results in expenses that exceed some high-cost threshold, while a medical event is catastrophic if it results in out-of-pocket expenditures that exceed a large portion of an individual's family income (Wyszewianski 1986). A high-cost event is not catastrophic if the individual has ample insurance and other financial resources to cover the resulting

medical expenses. However, a high-cost (or even a low-cost) medical event may become catastrophic if the individual's insurance coverage and financial resources are not sufficient to cover the medical expenses (Wyszewianski 1986). Consequently, we have developed a definition underinsurance that incorporates both characteristics of individuals' coverage and their level of income.

Without a limit on out-of-pocket medical expenditures, a high cost medical event could become catastrophic for both higher and lower income individuals. As a result, we have categorized insured individuals as underinsured if their policies contained characteristics that might leave them exposed to unlimited medical expenses. Such characteristics include: (1) a permanent preexisting condition exclusion; (2) no annual out-of-pocket limit on medical expenditures (that is, no a stop loss limit); or (3) a lifetime maximum payout of ≤ $50,000.

Furthermore, higher levels of cost sharing may be increasingly burdensome for lower income individuals. Consequently, we have incorporated the level of income into our definition of inadequate coverage. We also classify lower income individuals as underinsured if their insurance required a large degree of cost sharing due to: (4) a yearly deductible > $1,000; (5) coinsurance rates for hospitalization, physician services or prescription drugs > 20 percent or coinsurance rates for outpatient mental health services > 50 percent; or (6) an exclusion of coverage for hospitalization, physicians services, prescription drugs, or outpatient mental health services. The insurance characteristics we used are similar to indicators of underinsurance used in other research (Short and Banthin 1995; Bashshur et al. 1993; U.S. Congress 1990). The low-income threshold used in the models presented was a family income of $15,000 or less, which is similar to the federal poverty line in 1995 of $15,150 for a family of four (Blumberg and Liska 1996).

In addition, we estimated models in which preexisting condition exclusions were not used to determine the level of coverage. As of June 1997, HIPAA limits the use of permanent preexisting condition exclusions for individuals who have group coverage or who have made the transition from group coverage to individual coverage. As a result, estimating the effect of the health status and other covariates on the level of coverage after removing preexisting condition exclusions provides a simulation of the effect of HIPAA, possibly indicating whether HIPAA will alter the effect of health status and other covariates on the level of coverage.

Methods

We have estimated the effects that chronic illness and other covariates have on the probability of being uninsured, underinsured, or adequately insured. To estimate the effect of chronic illness on the adequacy of coverage, we have examined data from both healthy and chronically ill individuals. The data and the empirical estimation procedures are described in the following sections.

Data

The data for our study come from two 1994 samples in Indiana. We focused on one state to control for differences in coverage that could be attributed to different state policies and conditions. Indiana's uninsurance rate is 14.3 percent for the non-elderly compared with the national average of 17.7 percent (Winterbottom, Liska, and Obermaier 1995). Indiana has one of the nation's oldest state high-risk health insurance pools (Bovbjerg and Kollar 1986). This high-risk pool provides health insurance for individuals definitively denied coverage by private health insurers at rates somewhat higher than market rates for individual insurance. Also, Indiana has adopted modest insurance market reform

with limits on medical underwriting and mandated rate bands. Managed care penetration in Indiana is limited but increasing (Ginsburg and Fasciano 1996).

The first sample used in our study, called the South Bend Sample, was drawn from a stratified random sample of households in St. Joseph County, Indiana (the greater South Bend MSA), for a separate study of hypertension by the Indiana State Department of Health (Murphy 1993). Two methods were used to obtain the sample: (1) a county-wide, random-digit dialing of households, and (2) a house-to-house survey of households in 13 census tracts with high proportions of minorities and low-income people. Each nonelderly resident (aged 19 to 64) in the Department of Health study was ask to participate in our study. The Department of Health forwarded the names, addresses, and telephone numbers to project investigators at Indiana University. Of the 1,225 random contacts, 329 were too old (65+) to participate in our study. Of the remaining 896 individuals, 508 (57 percent) agreed to participate in our study (Kinney et al. 1997).

Questionnaires were sent to the individuals in the South Bend Sample asking for information about their health status. Based on the questionnaires, the respondents were divided into two groups depending on whether they suffered from a serious illness. The illnesses consisted of 23 serious conditions that affect the major organs including: heart disease, diseases of the nervous system, lung diseases, diseases of the glandular system, kidney diseases, liver diseases, skeletal diseases, muscle diseases, diseases of the immune system, drug or alcohol addiction, serious mental illness, high cholesterol, and cancer (Kinney et al. 1997). In all, there were 242 respondents in the South Bend Sample who completed the interviews (Kinney et al. 1997).

In the South Bend Sample, we oversampled among poor and minority individuals. Such individuals have higher incidence of chronic and other serious illnesses (Institute for Health and Aging

1996). Previous research has found that telephone survey response rates tend to be lower among lower-income populations because of their distrust of telephone surveys generally and the lack of continuous telephone service (Groves et al. 1988).

The second sample, called the "Cancer Sample," comprised two groups of cancer patients: (1) women with breast cancer and (2) men with testicular cancer. The sample of women with breast cancer was drawn from the tumor registries of the seven hospitals that treat over 90 percent of the women with breast cancer in Marion County, Indiana (the greater Indianapolis MSA) who resided in Marion County, had been diagnosed or treated in the study hospitals, were diagnosed or treated for breast cancer between January 1987 and December 1990, and were between 19 and 64 years old at the time of the survey. To protect confidentiality of patients, tumor registries contacted the patients and forwarded names of willing participants to project investigators. Tumor registries contacted 821 patients whom the hospitals recorded as having breast cancer during the relevant time interval. Of the 208 women who agreed to participate in the study, 34 (17 percent) had died, moved, were too ill, or were otherwise unreachable for a phone interview. As a result, there were 174 women with breast cancer in the Cancer Sample (Kinney et al. 1997).

The sample of men with testicular cancer was comprised of male residents of Indiana between ages 18 and 64 and diagnosed between 1987 and 1990. The sample was drawn from the tumor registry of Indiana University Medical Center (IUMC), which treats nearly all testis cancer patients in Indiana because oncologists at IUMC developed the prevailing treatment of testis cancer (Einhorn and Donohue 1977). Of the 195 patients contacted, 41 men with testicular cancer completed the interviews.

The Cancer Sample was draw from an administrative database, which is known to be unreliable in other contexts (Frey 1989). Thus, we suspect that many of the individuals contacted might not have been eligible for the sample. Because of confidentiality and liability concerns, the hospitals were unwilling to provide us with information on patients who declined to participate.

Overall our sample study consisted of 457 individuals: 242 from the South Bend Sample (106 healthy and 136 chronically ill individuals) and 215 from the Cancer Sample (174 breast cancer and 41 testicular cancer patients). Individuals in all samples were called for a phone interview about their health insurance benefits and job histories since 1984. To obtain as much accuracy as possible and to enable respondents to check relevant records, the interviewers mailed follow-up questionnaires.

We appreciate that our sample is not representative of the general population because individuals facing a serious illness were oversampled. Research on the general population has reported difficulty detecting problems specific to seriously ill people because few seriously ill people occur in the samples of the general population (Monheit 1994). We deliberately selected samples with ill individuals so that we could make more detailed inferences about such individuals. Using a non-random sample that oversampled the chronically ill was not problematic for the empirical estimates because the oversampling was based on the presence of a chronic illness and not on the characteristics of coverage, which were the outcome variables of interest in the current study.

Although our samples are drawn from different geographic locations, they are both within the Indiana. Thus, individuals in both samples face the same regulatory environment in the insurance market. Moreover, the variation in the populations of St. Joseph County (South Bend) and Marion County (Indianapolis) where most sample members live are quite limited. Specifically, rates of chronic illness, cancer, uninsurance, and poverty do not vary greatly between the two urban areas of St. Joseph

and Marion counties, according to data from the Indiana State Department of Health. Nevertheless, the South Bend sample does contain a larger portion of lower income and minority individuals because we oversampled. To control for potential differences between these groups, we included a dichotomous covariate indicating whether the individual was from the South Bend sample or from the Cancer sample, which consisted of patients from the greater Indianapolis MSA.

All samples contain information on six characteristics of individual's health insurance policies that, according to our definition of adequacy discussed above, could leave individuals exposed to large amounts of uncovered financial risk. The six characteristics are:

1. A permanent preexisting condition exclusion;
2. No annual out-of-pocket limit on medical expenditures (that is, no stop loss limit);
3. A lifetime maximum payout of ≤ $50,000;
4. A high yearly deductible (> $1,000);
5. High coinsurance rates for hospitalization, physician's services or prescription drugs (> 20 percent) or high coinsurance rates for outpatient mental health services (> 50 percent); and
6. an exclusion of coverage for hospitalization, physician's services, prescription drugs or outpatient mental health services.

Each of the six characteristics has been coded as a dichotomous variable indicating the presence of the characteristic. Demographic characteristics of individuals are shown in Table 1 and insurance characteristics are shown in Table 2.

Empirical Test

We have used characteristics of coverage along with income to categorize individuals as uninsured, underinsured, or adequately insured. To determine whether the presence of a chronic illness

decreased the probability of having adequate coverage, we used an ordered probit model, which allowed us to estimate the effects that a set of covariates had on the probability that an individual had one of the three levels of coverage. The following ordered probit model was used:

$$Prob[y = j] = \Phi\,[\mu_j - (\beta_0 + \beta_{ill} Ill + b\,\boldsymbol{x})] - \Phi\,[\mu_{j-1} - (\beta_0 + \beta_{ill} Ill + b\,\boldsymbol{x})] \qquad (1)$$

where: $y = 0$ (uninsured), $y = 1$ (underinsured), and $y = 2$ (adequately insured), *Ill* is a dichotomous variable equal 1 if the individual had a chronic illness and 0 if the individual did not have a chronic illness, $\boldsymbol{x}$ is a vector of other covariates, and μ_j is the jth threshold parameter with $\mu_{-1} = -\infty$, $\mu_0 = 0$, and $\mu_2 = +\infty$. The model was estimated using maximum likelihood (Green 1991, 1993).

The sign of each coefficient gives the effect that the covariate has on the probability that y assumes its highest level, which represents adequate insurance in our model. If the value of β_{ill} is negative, the presence of a chronic illness decreased the probability of having adequate insurance.

Marginal Effects

In addition to determining whether the presence of a chronic illness affected the level of coverage, we also estimated the magnitude of the effect. The marginal effect of a covariate gives the change in the probability of having each level of coverage resulting from a change in the covariate. The marginal effect of being ill on the probability of having each level of coverage can be estimated by calculating the difference in each of the following probabilities from equation (1) when $Ill = 0$ and $Ill = 1$ with all other covariates held at the value of a reference person (Green 1993):

$$\begin{aligned} Prob[y = 0\ (uninsured)] &= \Phi[-(\beta_{ill} Ill + b\,\boldsymbol{x})] \\ Prob[y = 1\ (underinsured)] &= \Phi[\mu_I - (\beta_{ill} Ill + b\,\boldsymbol{x})] - \Phi[-(\beta_{ill} Ill + b\,\boldsymbol{x})] \qquad (2) \\ Prob[y = 2\ (adequately\ insured)] &= 1 - \Phi[\mu_1 - (\beta_{ill} Ill + b\,\boldsymbol{x})]. \end{aligned}$$

Severity of Illness

In addition to the examination of the effect of illness on the adequacy of health insurance coverage described above, we sought to determine how greater severity of illness might affect the adequacy of coverage. To measure the impact of severity of illness, we used indicators of the self-reported health status of individuals and the number of comorbid conditions. The measure of self-reported health status consisted of three dichotomous covariates, indicating whether the individual reported that they were in excellent/very good health, good health, or fair/poor health. We use excellent/very good health as the omitted reference category. We used the number of comorbid conditions as a measure of severity of illness. For the South Bend sample, we had more information about individual's medical conditions and were able to examine the relation between the number of comorbid conditions and insurance adequacy. We included a dichotomous covariate in our models that indicated whether the individual had only one condition and an additional covariate that indicated whether the individual had two or more comorbid conditions. Because the number of comorbid conditions was not available in the Cancer sample (we knew only that the individuals had cancer), our examination of severity of illness was restricted to the South Bend sample.

Firm Size and Chronic Illness

Because underwriting practices are most prevalent in the small group and individual insurance markets, we have explored the impact of both having a chronic condition and working in a small firm. To do so, we included a covariate in the model indicating whether the individual worked in a small firm or was self-employed (*Smll*) a covariate representing the interaction between working in a small firm or being self-employed and having a chronic illness (*Ill_Smll*). We restricted our sample to individuals who were employed.

Results

The effects of the health status and other covariates on the level of coverage are presented in Tables 3 and 4. In the top half of each table, insured individuals were categorized as underinsured, rather than adequately insured, if they had any of the insurance characteristics that would not place an upper limit on potential out-of-pocket medical expenditures (characteristics (1) – (3) in the Methods section). In addition, low-income insured individuals were also considered underinsured if they had any of characteristics that would require a large amount of cost sharing (characteristics (4) – (6) in the Methods section). In the bottom half of each table, insured individuals were categorized as underinsured rather than adequately insured in the same manner as in the top half, except the presence of a permanent preexisting condition exclusion was not used as criterion for determining the level of coverage.

In Table 3, we have presented the estimated coefficients from the ordered probit and the implied marginal effects of the *Ill* covariate, which indicates whether the individual had a chronic illness. In Table 4, we have presented the coefficients of all covariates included in the models. The marginal effect of the *Ill* covariate was calculated holding all other covariates at the values of three specific reference persons, chosen to represent a range of individuals.

The first reference person is a married, white female with a high school diploma who works full time. The second reference person is a married, white male with a college degree who works full time. The third case reference person is a single, non-white female with a high school diploma who does not work full time. All three reference people are 45 years old, have one child, work in a large firm, and are not self employed.

Results for All Individuals

The following sections explore the effect that illness and other covariates had on all individuals in the sample. Because married individuals may have alternative sources of income and coverage through a spouse, we examined married and single individuals separately to determine whether factors affecting the level of coverage differ by marital status.

Effect of Health Status on the Level of Coverage. The results in the top half of Table 3 indicate that the presence of a chronic illness had a significant negative effect ($p = 0.02$) on the probability that an individual had adequate coverage. The results show that an individual in the first reference case had a 75 percent probability of having adequate coverage if the individual was not chronically ill and a 65 percent probability of having adequate coverage if the individual was chronically ill. The presence of a chronic illness decreased the probability of having adequate coverage by 10 percentage points. For an individual in the second reference case, the probability of having adequate coverage was 80 percent if the individual did not have a chronic illness and 71 percent if the individual did have a chronic illness. The presence of chronic illness decreased the probability of adequate coverage by 9 percentage points. For an individual in the third reference case, the probability of having adequate coverage was 42 percent if the individual did not have a chronic illness and 31 percent if the individual did have a chronic illness. The presence of a chronic illness reduced the probability of having adequate coverage by 11 percentage points. Thus, the presence of a chronic illness decreased the probability of having adequate coverage for each reference case by about 10 percentage points.

In addition, for both individuals in the first and second reference cases, the presence of a chronic illness increased the probability of being underinsured by 7 percentage points and increased the probability of being uninsured by 2 – 3 percentage points. For an individual in the third reference cases,

the presence of a chronic illness increased the probability of being underinsured by 3 percentage points and increased the probability of being uninsured by 8 percentage points.

The model in the bottom half of Table 3 is similar to the model in the top half, except the presence of a preexisting condition exclusion was not used to determine the level of coverage. When the level of coverage did not depend on the presence of a preexisting condition exclusion, health status no longer had a significant effect on the adequacy of coverage.

To determine whether the results were sensitive to alternative specifications of the level of coverage, we estimated several additional models. The two models described above were estimated using $25,000 as the low-income threshold. The presence of a chronic illness reduced the probability of adequate coverage by about 10 percentage points when preexisting condition exclusions were included among the criteria for determining the level of coverage but did not have a significant effect when preexisting condition exclusions were not included.

In addition, we estimated two models in which income was removed as a criterion for determining the level coverage. The categorization was based only on characteristics of coverage (characteristics (1) – (3) in the Methods section) that would not place an upper limit on potential out-of-pocket medical expenditures. Preexisting condition exclusions were included in one model and excluded in the other. Again, the results were similar to the results described above. Removing income as a criterion did not have a substantial effect because most low-income individuals who had high deductibles, high coinsurance rates, or service exclusions also had a preexisting condition exclusion, no annual limit on out-of-pocket expenditures, or a lifetime maximum payout of ≤ $50,000. As a result, most low-income individuals who were categorized as inadequately insured when income was among

the criteria for determining the level of coverage remained inadequately insured after income was removed as a criterion.

In summary, our results provide evidence that underwriting practices in the insurance market had a significant effect in reducing the level of coverage for chronically ill individuals. However, among all individuals in the sample, the reduction in level of coverage due to illness resulted mainly from permanent preexisting exclusion restrictions that would be limited under HIPAA rather than other characteristics of coverage.

Effect of Non-Health Covariates on the Level of Coverage. In addition to estimating the effect of health status on the level of coverage, we also estimated the effect of other covariates (including demographic and employment-related characteristics) on the level of coverage. The effects of the covariates on the level of coverage (Table 4) are generally the results that would be expected.

The effects of the demographic and education characteristics show that individuals with more opportunities for coverage are more likely to have adequate coverage. Married individuals were more likely to have adequate coverage, possibly reflecting the fact that married individuals have more potential sources of income and insurance coverage. In addition, individuals with higher levels of education were more likely to have adequate coverage relative to individuals who did not graduate from high school. The increased probabilities of adequate coverage may indicate that more educated individuals have better job opportunities with better benefits.

In addition to including the level of education, which may influence the level of coverage by affecting the quality of jobs available, we have also included work-related characteristics (firm size, full-time status, and self-employment status) directly in the models. Small firms may face higher costs of

obtaining health insurance, and as a result, they may be more likely to offer reduced coverage or offer no coverage at all (Monheit 1994). As expected, individuals who worked in a large firm had a greater probability of having adequate coverage relative to individuals who worked in small firms or who were unemployed. In the model presented, we considered firms large if they had more than 100 employees. We also estimated the models using 50 employees as the threshold for classifying firms as large, but the results did not change substantially.

Regardless of firm size, individuals who are employed full time (≥ 35 hours/week) are more likely to be eligible for coverage relative to other workers. The results indicate that being a full-time employee increased the probability of being adequately insured. As expected, our results also show that being self-employed reduced the probability of being adequately insured. Self-employed individuals have less incentive to obtain adequate insurance due to tax laws that limit the portion of expenditures on coverage that they can deduct (Fuchs 1996). In addition to firm size, full time status, and self-employment status, we estimated models that included categorical variables representing occupation and industry. However, none of the estimated coefficients were significant and were not presented.

The models presented were estimated both including and excluding the presence of a permanent preexisting condition exclusion as a criterion for determining the level of coverage. A comparison of the results in the top and bottom halves of Table 4 indicates that the absence of permanent preexisting condition exclusion did not change the sign or significance of the covariates in most cases. Thus, some individuals (such as, part-time workers or workers in small firms) have a greater probability of having coverage that could leave them exposed to large out-of-pocket expenses if a serious illness were to occur due to insurance characteristics not affected by HIPAA.

Regardless of whether the presence of a preexisting condition exclusion was used to determine the level of coverage, we found that the geographic group did not have significant effect on the probability of having adequate coverage among the married individuals. However, among the single individuals, we found that being in the South Bend sample decreased the probability of having adequate coverage. Our results highlight the difficulty that low-income single individuals (whose options for coverage are more limited) may have obtaining adequate health insurance coverage.

Married Individuals

Married individuals have more potential sources of income and coverage (through a spouse's employer) than single individuals, and are thus more likely to have access to adequate insurance. Among married individuals, we found that health status did not affect the probability of having adequate coverage regardless of whether we used preexisting condition exclusions to determine the level of coverage (Table 3). Furthermore, the results did not differ substantially with alternative model specifications when $25,000 was used as the low-income threshold or when income was excluded from the criteria for determining the level of coverage.

When we included indicators of self-reported health status (excellent/very good health, good health, or fair/poor health) in the models, we did not find a significant relation between the self-reported health status indicators and insurance adequacy. Moreover, among the married individuals in the South Bend sample (n = 298), having a greater number of comorbid conditions did not significantly effect the adequacy of coverage, regardless of whether the presence of a preexisting condition exclusion was used to determine the level of coverage.

Among the working married individuals (n = 214), we found that neither the coefficient on *Ill* (indicating that the individual had a chronic illness) nor *Ill_Smll* (indicating that the individual had a

chronic illness and worked in a small firm or was self-employed) was significant, regardless of whether used preexisting exclusion restrictions to determine the level coverage.

Single Individuals

Although health status did not have a significant effect on the level of coverage among married individuals, health status was a significant factor affecting the level of coverage among single individuals, who may have fewer alternative sources of coverage. When permanent preexisting condition exclusions were used to determine the level of coverage, chronic illness decreased the probability of having adequate coverage by about 25 percentage points among all reference case individuals (Table 3). When permanent preexisting condition exclusions were not used to determine the level of coverage, chronic illness decreased the probability of having adequate coverage by 15 to 20 percentage points for all reference cases (Table 3). Furthermore, the results did not differ substantially with alternative model specifications when $25,000 was used as the low-income threshold or when income was excluded from the criteria for determining the level of coverage. Thus, for single individuals, HIPAA may diminish but not eliminate the effect of health status on the level of coverage.

Severity of Illness. We did not a significant relation between the self-reported health status indicators and insurance adequacy. However, among single individuals in the South Bend sample (n = 159), having a greater number of comorbid conditions did have an impact on the adequacy of coverage. When preexisting condition exclusions were used to define the level of coverage, we found that having one condition reduced the probability of adequate coverage by about 30 percentage points for an individual in the first or second reference case and by about 35 percentage points for an individual in the third reference case. Having two or more comorbid conditions reduced the probability of adequate coverage by about 40 percentage points for an individual in the first or second reference case

and by about 43 percentage points for an individual in the third reference case. Thus, having two or more comorbid conditions decreased the probability of adequate coverage by 8 to 10 percentage points more than having only one or two comorbid conditions.

When the presence of a preexisting condition exclusion was not used to determine the level of coverage, having two or more comorbid conditions also had a greater impact on the probability of adequate coverage than having only one condition. However, the impact was reduced. Having one condition reduced the probability of adequate coverage by about 25 percentage points for an individual in the first or second reference cases and by about 28 percentage points for an individual in the third reference case. Having two or more comorbid conditions reduced the probability of adequate coverage by about 31 percentage points for an individual in the first or second reference cases and by about 34 percentage points for an individual in the third reference case. Thus, when preexisting condition exclusions were not used to determine the level of coverage, having two or more comorbid conditions decreased the probability of adequate coverage by nearly six percentage points more than having only one condition.

Firm Size and Chronic Illness. Among the working single individuals (n = 116), we did find that being chronically ill and working in a small firm were associated with the level of coverage. When preexisting condition exclusions were used to determine the level of coverage, we found that the coefficient on *Ill* was marginally significant (p = 0.072), but the coefficient on *Ill_Smll* was not significant (p = 0.175). However, when preexisting condition exclusion were not used to determine the level of coverage, we found that the coefficient on *Ill* was no longer significant (p = 0.203), but the coefficient on *Ill_Smll* was significant (p = 0.0572). Our findings imply that preexisting condition exclusions were not limited to individuals who worked in small firms. However, other characteristics of

coverage may be related to firm size, making adequate coverage especially difficult for single workers with chronic illnesses who work in small firms.

The results from our probit models are consistent with the results from Chi-square comparisons of each of the six characteristics of coverage versus firm size. We found that the presence of a preexisting condition exclusion was independent of firm size. However, we found that the portion of individuals with service benefit exclusions and high deductibles was significantly higher among individuals in small firms.

Discussion

Overall, the results have shown that the presence of a chronic illness decreased the probability of having adequate coverage by about 10 percentage points, increased the probability of being underinsured by 3 to 7 percentage points, and increased the probability of being uninsured by 2 to 8 percentage points among all individuals in the sample. There may be several reasons underlying the association between a reduction in the probability of adequate coverage and serious chronic illness. The association between inadequate coverage and chronic illness may reflect characteristics of the insurance market such as medical underwriting practices that tend to segment less healthy individuals into separate risk pools. The association between inadequate coverage and chronic illness may also result from characteristics of individuals. For example, individuals with serious chronic illnesses may have lower levels of coverage because the illness has limited their capacity or assertiveness, thereby impeding their ability to be effective self-advocates in choosing adequate coverage. In the current study, we have

explored the potential association between underwriting practices, chronic illness, and insurance adequacy.

A major factor that contributed to inadequate insurance among individuals with a chronic illness was a medical underwriting practice in which insurers exclude coverage for medical conditions that existed prior to the time the individual's policy was issued. However, the ability of insurers to impose permanent preexisting condition exclusions on individuals who have group coverage or who made the transition from group coverage to individual coverage is limited under HIPAA. When permanent preexisting health condition exclusions were not used to determine the level of coverage, chronic illness no longer had a significant effect on the level of coverage among all individuals in the sample. Our findings emphasize the impact of rigorous enforcement of HIPAA. However, it is important to note that will HIPAA will do nothing to protect chronically ill individuals who do not have insurance coverage in the first place.

Because married individuals may have alternative sources of income and coverage through a spouse, we examined married and single individuals separately. For married individuals, chronic illness did not have an effect on the level of coverage, regardless of whether preexisting condition exclusions were used to determine the level of coverage. However, among single individuals, chronic illness significantly decreased the probability of having adequate coverage.

When permanent preexisting condition exclusions were used to determine the level of coverage, chronic illness decreased the probability of having adequate coverage among single individuals by about 25 percentage points. When permanent preexisting condition exclusions were not used to determine the level of coverage, chronic illness decreased the probability of having adequate coverage among single

individuals by 15 to 20 percentage points. Thus, for single individuals, HIPAA may reduce but not eliminate the effect of health status on the level of coverage.

HIPAA could potentially increase the probability of adequate coverage among chronically ill single individuals by 5 to 10 percentage points; however, the effect of HIPAA may be reduced if it is not fully enforced. Enforcement of HIPAA may be hampered if states do not enact legislation to require compliance with the provisions of HIPAA (U.S. GAO 1998). In states failing to enact such legislation, enforcement will be left to the U.S. Department of Health and Human Services (HHS). According to a General Accounting Office report, HHS resources have been strained as its regulatory role has expanded into five states failing to enforce some provisions of HIPAA, and HHS resources will be strained further if it expands its regulatory activities into other states not enforcing some provisions of HIPAA (U.S. GAO 1998). As of October 1997, four states where HHS enforcement activities have not begun had not placed limits on preexisting condition exclusions in large group markets (U.S. GAO 1998). With a lack of enforcement by some states and with limited resources for enforcement by the federal government, the potential impact of HIPAA may be diminished.

The impact of HIPAA on the level of coverage may be diminished further if insurers who are unable to use preexisting condition exclusions increase their use of other medical underwriting practices, increasing the price of coverage for chronically ill individuals. Although HIPAA does limit the use of permanent preexisting condition exclusions for individuals who have group coverage or who have made the transition from group coverage to individual coverage, HIPAA does not prohibit all forms of medical underwriting. Other medical underwriting practices such as lowering the maximum lifetime payout for specific diseases might still be permitted under HIPAA. If insurers are no longer able to impose permanent preexisting condition exclusions, they might respond for example by limiting the maximum

payout for illnesses that they previously excluded from coverage. In addition, evidence suggests that individuals eligible for coverage in the individual market under HIPAA may face premiums that are 140 percent to 600 percent of the standard rates (U.S. GAO 1998). Future research might address the extent to which limitations in the use of permanent preexisting condition exclusions results in increased use of other underwriting practices.

Endnotes

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Table 1. Demographic Characteristics of Study Sample

Variable	All Individuals (n = 457)	Married Individuals (n = 298)	Single Individuals (n =159)
Mean (Std. Dev.)			
Age	45.9	47.07	43.71
	(11.9)	(10.8)	(13.4)
Number of Children	1.0	1.20	0.56
	(0.4)	(1.4)	(1.2)
Percent (%)			
Chronically Ill	76.8	78.5	73.6
Female	70.5	71.8	67.9
Non–white	20.1	15.1	29.6
Married	65.2	100.0	NA
Spouse Works	51.2	78.5	NA
INCOME LEVEL:			
$14,999 or Less	17.9	8.4	36.3
$15,000 – $24,999	15.3	9.4	26.4
$25,00 – $34,999	19.0	21.1	15.1
$35,000 – $49,999	18.4	21.5	12.6
$50,000 or More	29.3	39.6	10.1
EDUCATION:			
Less than High School Diploma	10.1	9.1	11.9
High School Diploma	35.5	33.9	38.4
Some College or Technical School	24.7	24.5	25.2
College Degree	13.8	14.1	13.2
Some Post–Graduate or Graduate Degree	16.0	18.5	11.3
EMPLOYMENT STATUS:			
Unemployed	27.8	28.2	27.0
Employed in Small Firm (≤ 100 Employees)	23.5	23.1	15.7
Employed in Large (>100 Employees)	51.6	48.7	57.2
Employed Full Time (≥ 35 Hours/Week)	57.8	57.7	57.9
Self–Employed	8.5	1.0	0.6

Source: The Robert Wood Johnson Barriers to Health Insurance Project, 1994.

Table 2. Insurance Characteristics of Study Sample

	All Individuals (%) (n = 457)	Married Individuals (%) (n = 298)	Single Individuals (%) (n = 159)
Level of Coverage			
Uninsured	62 (13.6)	30 (10.1)	32 (20.1)
Preexisting Condition Exclusions Included			
Underinsured	160 (35.0)	104 (34.9)	56 (35.2)
Adequately Insured	235 (51.4)	164 (55.0)	71 (44.7)
Preexisting Condition Exclusions Excluded			
Underinsured	135 (29.5)	89 (29.9)	46 (28.9)
Adequately Insured	260 (56.9)	179 (60.1)	81 (50.9)
Insurance Policy Characteristics			
Permanent Preexisting Condition Exclusion	32 (7.0)	17 (5.7)	15 (9.4)
No Annual Out of Pocket Limit	126 (27.6)	85 (28.5)	41 (25.8)
Lifetime Maximum Payout ≤ $50,000	2 (0.4)	2 (0.7)	0 (0.0)
High Yearly Deductible	18 (3.9)	13 (4.4)	5 (3.2)
High Coinsurance Rates	19 (4.2)	13 (4.4)	6 (3.8)
Service Exclusions	66 (14.4)	49 (16.4)	17 (10.7)

Source: The Robert Wood Johnson Barriers to Health Insurance Project, 1994

Table 3. Probability of Coverage Level by Health Status Calculated from Ordered Probit Results of Study Sample, 1994[a] (in percents)

VARIABLE: ILL	Reference Person 1[b]			Reference Person 2[c]			Reference Person 3[d]		
	Adequately Insured	Under–Insured	Uninsured	Adequately Insured	Under–Insured	Uninsured	Adequately Insured	Under–insured	Uninsured
	Preexisting Condition Exclusions Included								
	All (N = 457; Coefficient: –0.29; *P*–value: 0.02)[e]								
Probability if Ill	65	29	6	71	25	4	31	45	24
Probability if Not Ill	75	22	3	80	18	2	42	42	16
Marginal Effect of Being Ill on Prob.	–10	7	3	–9	7	2	–11	3	8
	Married (N = 298; Coefficient: –0.06; *P*–value: 0.37)[e]								
Probability if Ill	65	30	5	73	24	3	48	41	11
Probability if Not Ill	67	29	4	75	23	3	50	40	10
Marginal Effect of Being Ill on Prob.	–2	1	1	–2	2	0	–2	1	1
	Single (N = 159; Coefficient: –0.70; *P*–value: 0.00)[e]								
Probability if Ill	51	37	12	56	35	10	26	43	31
Probability if Not Ill	76	21	3	80	18	2	52	37	12

Table 3. Continued

VARIABLE: ILL	Reference Person 1[b]			Reference Person 2[c]			Reference Person 3[d]		
	Adequately Insured	Under–Insured	Uninsured	Adequately Insured	Under–Insured	Uninsured	Adequately Insured	Under–insured	Uninsured
	Preexisting Condition Exclusions *Not* Included								
	All (N = 457; Coefficient: –0.16; *P*–value: 0.14)[e]								
Probability if Ill	70	24	6	78	19	4	41	38	21
Probability if Not Ill	75	20	4	82	16	3	47	36	17
Marginal Effect of Being Ill on Prob.	–5	4	2	–4	3	1	–6	2	4
	Married (N = 298; Coefficient: 0.06; *P*–value: 0.37)[e]								
Probability if Ill	71	25	5	77	20	3	56	34	10
Probability if Not Ill	68	26	6	75	22	4	54	35	11
Marginal Effect of Being Ill on Prob.	3	–1	–1	2	–2	–1	2	–1	–1
	Single (N = 159; Coefficient: –0.50; *P*–value: 0.02)[e]								
Probability if Ill	60	29	12	70	23	7	38	36	26
Probability if Not Ill	77	18	4	85	13	2	58	30	13
Marginal Effect of Being Ill on Prob.	–17	11	8	–15	10	5	–20	6	13

[a]All three reference people are age 45, have one child, work in a large firm, and are not self–employed.
[b]A married, white female with a high school diploma who works full–time.
[c]A married, white male with a college degree who works full–time.
[d]A single, non–white female with a high school diploma who does not work full–time.
[e]Because we have a hypothesis about the sign of the coefficient, we report the *p*–value for a one–tailed test.
Source: The Robert Wood Johnson Barriers to Health Insurance Project, 1994.

Table 4. Results from Ordered Probit Models in Study Sample, 1994

Variable	ALL (N = 457)			MARRIED (N = 298)			SINGLE (N = 159)		
	Coefficient	Standard Error	*P*–Value	Coefficient	Standard Error	*P*–Value	Coefficient	Standard Error	*P*–Value
	Preexisting Condition Exclusions Included								
Constant	0.00	0.33	1.00	0.28	0.50	0.57	0.14	0.57	0.81
Ill	–0.29	0.14	0.02	–0.06	0.19	0.37	–0.70	0.24	0.00
Demographic Characteristics:									
Age	0.01	0.01	0.23	0.00	0.01	0.92	0.02	0.01	0.11
Female	0.29	0.14	0.04	0.17	0.18	0.34	0.42	0.23	0.07
Non–White	–0.15	0.14	0.30	–0.08	0.20	0.67	–0.26	0.25	0.29
Number of Children	–0.08	0.04	0.07	–0.11	0.05	0.04	–0.09	0.09	0.33
Married[a]	0.35	0.13	0.00	Not Included			Not Included		
Spouse Works[a]	Not Included			0.26	0.18	0.07	Not Included		
Education:[b]									
High School Diploma	0.41	0.19	0.04	0.69	0.24	0.01	–0.05	0.38	0.90
Some College	0.54	0.21	0.01	0.75	0.26	0.00	0.22	0.41	0.59
College Degree	0.87	0.25	0.00	1.07	0.31	0.00	0.49	0.48	0.30
Some Post–Graduate or Graduate Degree	0.73	0.23	0.00	0.91	0.28	0.00	0.25	0.52	0.63
Work Characteristics:[a]									
Works in Large Firm (> 100 Employees)	0.21	0.13	0.05	0.12	0.17	0.24	0.38	0.27	0.08
Works Full Time (≥ 35 hours/week)	0.39	0.14	0.00	0.34	0.17	0.03	0.42	0.26	0.06
Self Employed	–0.51	0.18	0.00	–0.56	0.22	0.01	–0.50	0.41	0.11

Table 4. Continued

Variable	ALL (N = 457)			MARRIED (N = 298)			SINGLE (N = 159)		
	Coefficient	Standard Error	*P*–Value	Coefficient	Standard Error	*P*–Value	Coefficient	Standard Error	*P*–Value
	Preexisting Condition Exclusions *Not* Included								
Constant	–0.03	0.33	0.93	0.21	0.51	0.69	0.26	0.56	0.64
Ill	–0.16	0.14	0.14	0.06	0.19	0.37	–0.50	0.23	0.02
Demographic Characteristics:									
Age	0.00	0.01	0.46	–0.00	0.01	0.89	0.01	0.01	0.29
Female	0.29	0.14	0.03	0.16	0.18	0.38	0.49	0.23	0.03
Non–White	–0.17	0.14	0.25	–0.07	0.20	0.72	–0.30	0.25	0.23
Number of Children	–0.05	0.04	0.22	–0.10	0.05	0.07	–0.04	0.10	0.72
Married[a]	0.31	0.13	0.01	Not Included			Not Included		
Spouse Works[a]	Not Included			0.29	0.19	0.06	Not Included		
Education:[b]									
High School Diploma	0.41	0.19	0.03	0.79	0.25	0.00	–0.20	0.37	0.58
Some College	0.51	0.21	0.01	0.83	0.27	0.00	–0.00	0.39	0.99
College Degree	0.93	0.25	0.00	1.41	0.32	0.00	0.56	0.46	0.23
Some Post–Graduate or Graduate Degree	0.74	0.24	0.00	0.96	0.29	0.00	0.22	0.51	0.66
Work Characteristics:[a]									
Works in Large Firm (> 100 Employees)	0.26	0.14	0.03	0.11	0.17	0.27	0.52	0.27	0.03
Works Full Time (≥ 35 hours/week)	0.30	0.14	0.02	0.28	0.18	0.06	0.26	0.26	0.16
Self Employed	–0.43	0.19	0.01	–0.52	0.22	0.01	–0.29	0.41	0.24

[a]Because we have hypotheses about the signs of these coefficients, we report the *p*–values for a one–tailed test for noted covariates. For all other covariates, we report the *p*–value for a two–tailed test.

[b]Individuals are in an education category if it is the highest level of education that they received. The probabilities for each category are calculated relative to having less than a high school diploma.

Source: The Robert Wood Johnson Barriers to Health Insurance Project, 1994.

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