The Accuracy of Reported Insurance Status in the MEPS

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Abstract

Estimates of the number of insured and uninsured Americans are watched by numerous policymakers and the public, yet studies find respondents do not perfectly report their insurance status. Using four sources of validation data, including surveys of employers and providers, this paper assesses the quality of respondents' reports of private insurance and uninsurance in the Medical Expenditure Panel Survey Household Component (MEPS-HC), a nationally representative household survey. Regression analysis is used to assess the extent to which factors are associated with disagreements in reported insurance status across sources.

Introduction

About a quarter of the nonelderly population lacked insurance at some time during 2005 (Rhoades and Chu 2007). Addressing the lack of insurance is an ongoing health care policy issue, and accurate information about the number of uninsured and their characteristics is important for making sound policy. Household surveys are the primary source of information about the uninsured. Yet, validation studies have found errors in reported insurance status in a variety of surveys, and error rates vary considerably across surveys. Measurement error in estimates of the uninsured has become a topic in policy circles, because uncertainty about the number and characteristics of the uninsured may be a barrier to policy solutions (Czajka and Lewis 1999; Hunter 2004). Due to these concerns, the Census Bureau now issues caveats about the accuracy of insurance estimates from the Current Population Survey (CPS) (DeNaves-Walt et al. 2005). The Department of Health and Human Services commissioned efforts to adjust estimates from the CPS for underreported Medicaid enrollment (Callahan and Mays 2005; Giannarelli et al. 2005). The Robert Wood Johnson Foundation has supported several studies of Medicaid underreporting in state surveys, as well as a study of potential errors in administrative data (Call et al. 2007b).

This paper assesses the level of accuracy in reporting private insurance and uninsurance in the Medical Expenditure Panel Survey Household Component (MEPS-HC), a nationally representative household survey conducted by the U.S. Agency for Healthcare Research and Quality. Private insurance covers four-fifths of the insured nonelderly, is a component of efforts in Massachusetts to cover the uninsured, and, unlike public insurance, has been the subject of comparatively few validation studies. The lack of insurance also has been difficult to study. The 1996 MEPS had four sources of data that can potentially validate insurance status for reported by the family respondent: insurance cards and policy booklets, which provide physical evidence of coverage; reports from employers and insurance companies about private insurance; and reports from medical providers about sources of payments, especially insurance, for health services. None of these data sources is a gold standard, so I assessed factors that may be associated with errors by households, employers, and providers. These factors include misreporting in large and complex families (Pascale 2007), longer recall periods for households and employers, and employer and provider misreporting.

Four separate analyses focused on different aspects of potential misreporting among the nonelderly. First, I examined whether some individuals who reportedly had private insurance actually lacked it, using three types of validation data (insurance cards, policy booklets, and employer and insurance companies) to compensate for weaknesses in any one source.

Second, using data from employers and insurance companies, I examined whether some individuals who reportedly lacked private insurance actually had it. The third and fourth analyses examined the extent to which the reportedly uninsured had reports of insurance from employers and providers. These four analyses were feasible for only a subset of sample members, so I assessed whether the subset contained more compliant respondents and used measures of compliance and other measured characteristics to extrapolate to the full population.

The next section reviews survey methodology and validation studies of reported insurance status. Then, MEPS-HC insurance status questions, validation data, analytic samples, and the results from studies benchmarking the MEPS-HC to Medicaid enrollment estimates are described. A section with hypotheses and methodology highlights common regression methods, variables used to assess the factors associated with misreporting, and nonresponse analyses. The results section separately assesses reported private insurance and reported uninsurance and extrapolates to persons without validation data. The overall agreement rate for private insurance, patterns across the four analyses, and comparisons with other studies are presented.

Previous Survey Methods and Validation Studies

The survey methodology literature suggests several reasons for general misreporting in surveys (summarized in, for example, Tourangeau, Rips, and Rasinski 2000), and a few studies have focused on misreporting insurance status. Respondents more accurately report their own experiences than those of others, and many surveys, including the CPS, Survey of Income and Program Participation (SIPP), and MEPS, ask one respondent to report on all household or family members. To save time and avoid repetition, many household surveys first ask whether anyone in the family has a specific type of insurance, and, if the answer is yes, then the respondent is asked who has it. Using a split-sample experimental survey, Hess et al. (2001) found that reports of public coverage from "anyone/who?" questions had lower test-retest reliability than reports from asking separately about each family member. Using cognitive interviews, Pascale (2007) found that respondents for larger or more complex families sometimes forgot to report insurance status for all family members. This may arise from the fact that eligibility for private insurance is typically based on smaller family units: married adults and their minor children, or a single adult and the adult's minor children. In more complex families, respondents may be less well informed about some family members' sources of coverage, which could lead to misreporting. Pascale notes that in many surveys, uninsurance is a residual category of people without insurance reported from any source, so overlooking a person may lead to overestimates of the uninsured. Another reason for misreporting is respondent fatigue, which is related to the complexity and length of the interview. Blumberg et al. (2004) found that when families had longer interviews, controlling for other factors, they were more likely to report that their children were uninsured. Limited recall also can cause misreporting, because respondents are less able to precisely remember events further in the past, so they may misreport when insurance began or ended. There are a variety of potential temporal reporting biases, such as forward telescoping, backward telescoping, and reporting dates in the middle of the reference period, rather than throughout the reference period. In fact, some respondents report insurance status at the time of the interview, disregarding the question reference period (Pascale 2007).[1] This can cause false positives and false negatives for insurance status in a specific previous month. Salience is another factor: accuracy is likely greater when insurance is more important to a respondent, but memory aids and other cues can improve accuracy (Cohen and Martinez, n.d.). Respondents might more accurately report coverage from comprehensive insurance than from insurance that covers only some services. For example, Walden et al. (1984) found people with private insurance more accurately report their hospital coverage than coverage for other services.

Validation studies of surveys have found a range of error rates in reported health insurance status across a variety of surveys, types of insurance studied, and validation methods. While insurers' and employers' administrative data can be used to validate reported insurance, a major limitation to this area of research is difficulty validating lack of insurance.

Only one validation study has looked at both public and private sources of insurance. Nelson et al. (2000) used the Behavioral Risk Factor Surveillance System (BRFSS) survey to conduct in-person interviews with 351 adults in Wisconsin who reported they were insured and 67 private and public insurers identified by the adult respondents. Only 2.2% had insurers report that the adults were uninsured. The authors found much greater inconsistencies in reporting public versus private insurance and duration of coverage. For example, when an insurer said an adult was insured for a year or less, 60% of the adults reported being insured for more than a year by that insurer.

Four studies have found a range of errors in reporting private insurance. Davern et al. (2005) studied the Minnesota Adult Tobacco Survey, which used administrative data from a large insurance company as a sampling frame, and interviewed via telephone privately insured, nonelderly adults in Minnesota. They found very few reported they were uninsured (0.3%) or did not have private insurance (0.6%). Walden et al. (1984) examined the 1977 National Medical Care Expenditure Survey

(NMCES), an in-person household survey that was a predecessor to the MEPS, using data from a follow-back survey of employers and insurance companies. Among individuals reportedly privately insured lacked private insurance, employers and insurance companies did not report providing insurance to 0.9%. In addition, 12.0% of those reportedly lacking private insurance had employers report insurance. In their Wisconsin study, Nelson et al. (2000) found that among adults reporting private insurance, nearly one in five actually had public insurance. Among adults whose insurer reported they were privately insured, 6.2% did not report it. Using linked surveys of employers and their employees, Berger et al. (1998) found that 21% of workers and their employers disagreed about whether the worker was eligible for insurance.

Validation studies have found significant error rates for reporting Medicaid in two federal surveys, the CPS and the SIPP, and other nonfederal surveys. Davern et al. (2007a) matched national Medicaid administrative data to the CPS and preliminarily found that 42% of nonelderly Medicaid enrollees did not report Medicaid coverage. In a similar study of MediCal, California's Medicaid program, Klerman et al. (2005) found that 28% of adult MediCal enrollees did not report they were in MediCal, and 2% of CPS adults who, according to administrative records, did not have MediCal reported they had MediCal. In contrast, Card et al. (2004) found in the SIPP that 14.7% of MediCal enrollees did not report they were in MediCal, and between 1 and 3% of sample members not in MediCal administrative data said they were enrolled. Studies that validate responses to state-specific telephone surveys with administrative data have mostly estimated rates of false negatives between those found in the CPS and SIPP (Call et al. 2007b; Eberly et al. 2005; Kincheloe et al. 2006; Klerman et al. 2005).[2] Moreover, Davidson (n.d.) estimated that at least 3% and perhaps 10% of the Pennsylvanians reportedly in Medicaid, State Children's Health Insurance Program (SCHIP), and state-funded programs were in fact uninsured. His estimates, when converted to false negatives as a proportion of those not in Medicaid, are similar in magnitude to those found in the studies of the CPS and SIPP in California.

Two differences in survey design may account for greater error rates for MediCal in the CPS than the SIPP. First, the recall period in the CPS is the previous calendar year, while the SIPP has a shorter recall period. Consistent with evidence from cognitive interviews (Pascale 2007), Davern et al. (2007a), Klerman et al. (2005) and Eberly et al. (2005) found CPS respondents' reports on prior insurance status are partially influenced by their current status. Second, the CPS does not always use program names known to respondents. In a validation study of the CPS questions using administrative data from the Maryland Medicaid program, adding more state-specific program names to the CPS questions greatly reduced underreporting (Eberly et al. 2005).[3]

Respondents who did not report their Medicaid coverage reported other coverage or uninsurance. Studies of the CPS and state-specific surveys found many of those who did not report their Medicaid coverage report other public programs or private coverage (Call et al. 2001; Call et al. 2007b; Davern et al. 2007a). Among nonelderly CPS sample members with Medicaid, 24.6% report other public or private coverage (Davern et al. 2007a), much more than the 6.4% to 16.7% of Medicaid enrollees reported in three state surveys (Call et al. 2007b). Eighteen percent of nonelderly CPS sample members with Medicaid were reportedly uninsured (Davern et al. 2007a). Studies of state surveys have found a range of estimates of the percentage of Medicaid enrollees who reportedly were uninsured, from 3.4% in Pennsylvania to 10.4% in California (Call et al. 2007b). Differences in survey interview methods, questions, and response rates are likely factors in the variation in response errors across states and studies (Call et al. 2007a).

Respondents often correctly do not report partial Medicaid benefits as insurance coverage. Medicaid enrollees with partial benefits include pregnant women eligible for only pregnancy-related services,[4] adults eligible for only family planning services, people eligible for only tuberculosis-related services, and noncitizens eligible for only emergency services (Benson Gold et al. 2005; Hoffman et al. 2000). Surveys do not ask respondents to distinguish between full and partial Medicaid benefits. Kincheloe et al. (2006) found half of enrollees with partial benefits reported not having Medicaid and the other half reported Medicaid coverage.

Some socioeconomic factors are correlated with accurate reporting. Call et al. (2007b) found that, controlling for other factors, poor and unemployed people were more likely to accurately report having Medicaid, but no socioeconomic characteristics were consistently associated with Medicaid enrollees incorrectly reporting uninsurance. Davern et al. (2007b) found more errors among lower income families, children, women, and some racial and ethnic groups. Using bivariate statistics, income, ethnicity, and education have been found to be correlated with misreporting Medicaid coverage. Card et al. (2004) found that Medicaid enrollees with higher ratios of family income to the poverty line were less likely to correctly report they had Medicaid, but those with lower income to poverty ratios were more likely to report having Medicaid when in fact they did not, perhaps because they assumed they would be eligible for Medicaid if they needed care. Klerman et al.

(2005) found that Hispanic Medicaid enrollees and those with some college education were less likely to report their Medicaid coverage.

In all the validation studies, the level of misreporting in cases that could not be validated, however, is unknown and may be higher than among those who cooperated with the validation study. For example, Nelson et al. (2000) excluded adults who did not complete permission forms to contact insurers. Kincheloe et al. (2006) could not locate via telephone and gain the cooperation of 42% of their sampled adults. Card et al.'s (2004) study of the SIPP excluded respondents who did not provide Social Security numbers, which were used to match to MediCal administrative data. Davern et al. (2006) report much greater success matching CPS and Medicaid data in most states other than California, and they find less accurate reporting than did Klerman's and colleague's (2005) study of MediCal. To address the problem of having a potentially less representative sample, Klerman et al. (2005) extrapolated the rates of false negatives and positives to their unmatched sample, conditioning the rates on characteristics measured in both the matched and unmatched samples. The resulting estimates of MediCal enrollment in 2000 do not benchmark administrative data unless the rates of false negatives in the unmatched sample are 1.4 times that of adults in the matched sample and 2.4 times that of children in the matched sample. These findings suggest that people who do not participate in validation studies report Medicaid enrollment less accurately.

In summary, validation studies find insurance status is sometimes misreported. Error rates vary across surveys, perhaps depending on the recall period of the interview, family size and complexity, question wording, duration of the interview, and other factors. Some respondents misreport the source of coverage, and misreporting appears to vary with personal and family characteristics. Some people with partial Medicaid benefits report Medicaid coverage, but they lack insurance. Little is known about errors reporting a lack of insurance coverage, because there is no way to completely validate this report. Many existing validation studies may not be generalizeable beyond their limited populations. Thus, studies of specific surveys, including the MEPS-HC, are needed. These studies should assess the factors associated with misreporting, attempt to shed light on misreporting uninsurance, and attempt to generalize beyond potentially biased subpopulations with validation data.

The MEPS

The data for this study are from the 1996 MEPS-HC. In the MEPS-HC, each family was interviewed five times over two and a half years to obtain annual data reflecting a two year reference period (Cohen 1997). A family consists of all related persons in the household. Separate interviews were conducted for each family and each unrelated individual in the household. The analyses rely on 1996 data because that is the only year for which (1) policy booklets were collected and (2) respondents to the follow-back survey of employers and insurance companies reported on the employees' and policyholders' insurance status, rather than only whether the establishment offered insurance.

Insurance Status
The MEPS-HC asked about insurance from a comprehensive list of all possible sources of insurance. In the first interview, conducted between March and August, the MEPS-HC asked the family respondent about insurance held at any time since January 1st. Because employment-related insurance is the most prevalent source of insurance, for each family member age 16 and older, the respondent was asked about all jobs held since January 1st, jobs they had retired from, and the last job held. The family respondent was asked whether the employee received insurance through each job identified. This person-level approach to identifying policyholders of employment-related insurance is unique among household surveys. Then the respondent was asked whether anyone in the family had:

- Medicare

- Medicaid

- Tricare/Champus/Champva

- For those who did not report Medicaid, any other type of health insurance through any state or local government agency which provided hospital and physician benefits [5]

- Health benefits from other state programs or other public programs providing coverage for health care services (some of which are later classified as Medicaid)

- Other sources of private insurance, such as from a group or association, insurance company, previous employer, union, or other employers not previously mentioned.

For each source of private and public insurance, the MEPS-HC asked which family members were covered, whether coverage lasted the entire time since January 1st, and if not, in which months. State-specific public program names are used in the questions. For each source of private coverage, the MEPS-HC asked about covered services. Single-service and dread disease plans, the Veterans Administration, the Indian Health Service, workers compensation, and state programs with limited benefits, such as prescription assistance programs, are not included in measures of hospital and physician insurance. Insurance status is not imputed to families with missing data, which are rare.

The health insurance section of the first interview concluded with questions about family members' insurance status in 1994 and 1995. These questions started by reviewing the insurance reported earlier in the section. This structure may effectively serve as a confirmation question, because interviewers could return to earlier questions or enter comments to change prior entries during data editing.

In the second interview, conducted between August and December, the MEPS-HC asked questions based on jobs and insurance reported to be held at the time of the first interview to determine whether previously reported insurance was still held or when it ended. This use of questions dependent on answers provided in earlier interviews may reduce temporal reporting errors. The MEPS also asked about new jobs and insurance from those jobs, public insurance acquired since the first interview, and insurance acquired from other private sources since the first interview. The recall period was not especially long, typically four to seven months. The third interview, conducted in the following calendar year, updated insurance status since the second interview. Responses to the questions from the first three interviews were used to construct monthly indicators of insurance coverage in 1996.

Benchmarking Reported Medicaid Enrollment

Studies benchmarking MEPS-HC estimates to Medicaid and SCHIP enrollment data suggest that the MEPS-HC undercounts about 12% to 15% of noninstitutionalized Medicaid enrollees (Banthin and Sing, forthcoming; Nelson 2003; Peterson and Grady 2005). A similar undercount has been found in the SIPP, and a larger one in the CPS has been known for some time (Czajka and Lewis 1999; Holahan et al. 1995; Nelson 2003, Peterson and Grady 2005; Sheils and Haught 2003; Swartz 1989). In a more recent study of the 2000 CPS, Davern et al. (2007a) narrowed the gap somewhat by excluding from the administrative data 3.3 million nonelderly enrollees with partial Medicaid benefits. If this adjustment were applied to Banthin's and Sing's analysis of the 2000 MEPS, the undercount would fall to 5%. Some individuals with partial Medicaid benefits do report Medicaid coverage, so excluding those with partial coverage likely yields a best-case benchmark (Call et al. 2007b; Kincheloe et al. 2006).

Validation Data

The 1996 MEPS included up to four data sources that can be used to assess the quality of health insurance status reported by families: (1) the HC interviewers asked respondents to show insurance cards, (2) the HC interviewers ask respondents to provide policy booklets, (3) separate interviews were conducted with family members' employers and insurance companies, and (4) information was collected from medical providers about sources of payment for services. Respondents for the family, employers, insurance companies, or providers could all err in reporting a person's insurance status; none provides a gold standard of information. Furthermore, there was significant nonresponse by employers and insurance companies, and only some providers were selected for follow-back interviews.

Insurance Cards. I constructed a person-level summary measure of whether the respondent showed the interviewer a private insurance card.[6] In the first interview, for each reported source of private insurance (for example, through a person's employer) in the family, the interviewer asked to see an insurance card. For each source of insurance, I assumed that if an insurance card was shown, the card validated insurance for every family member reported as covered by that source of insurance. Much of the analysis focuses on July, which was after the first interview for most sample members. If the sample member reported having private insurance from that source in July, then I assumed the insurance card validated the reported insurance in July.

Policy Booklets. In the first and second interview, the interviewer asked for policy booklets to each source of private insurance reported in the first interview. Interviewers did not seek booklets for (1) private insurance related to federal employment, because these were available from other sources, and (2) insurance from policyholders residing elsewhere, because booklets were unlikely to be available.[7] Validating insurance from outside the coresiding family is very difficult. I assume that if a policy booklet was

provided, then everyone in the family reported as covered by that source of private insurance also had their private insurance status validated.

Employers and Insurance Companies. For the 1996 MEPS sample of households, the linked Insurance Component (IC) attempted to collect information from related employers, unions, and insurers (Cooper et al. 1999). For nearly all HC sample members with jobs at the time of the first interview, MEPS attempted to interview their employers. For sample members with private insurance at the time of the first interview, MEPS attempted to interview employers, former employers, unions, and insurance companies providing insurance. Specifically, the sample frame consisted of the following types of establishments:

1. Main employers for each worker age 16+.[8]

2. Other employers providing insurance with hospital and physician benefits, such as former employers providing severance packages, COBRA, or retiree health insurance.

3. Unions providing insurance with hospital and physician benefits.

4. Insurance companies and/or agents providing insurance with hospital and physician benefits.

Each IC respondent could confirm or contradict the family's report of private insurance covering hospital and physician services or no insurance from that source. All employers and insurance companies were asked about the status of the employee, union member, retiree, or policyholder from the HC, hereinafter called employee or policyholder, as of July 1st, 1996. If this person was a current or former employee or policyholder, or relative or survivor of an employee or policyholder, then MEPS asked about the person's insurance through the establishment as of July 1st. Employees and policyholders were validated as insured if any establishment reported they were insured. An employer was coded as not insuring the person if it did not offer insurance, it reported the person was a contract employee or employed by a temporary agency, or the employee was not eligible or not enrolled in hospital/physician insurance. An insurance company was coded as not insuring the person if the company reported the person did not have any insurance from that source or had only a single service, dread disease, or cash benefit plan, which is not counted in the MEPS as comprehensive coverage.

Establishments could also provide information confirming or contradicting other family members' private insurance or lack of insurance by reporting whether the person had single, adult-adult, adult-child, family, or no coverage. I assumed that if the family respondent reported a dependent had insurance through an employer, union, or insurance company, and the IC respondent reported the family coverage, then the dependent's insurance was validated.[9] When the establishment reported no coverage, then the health insurance eligibility unit (HIEU), a subfamily unit constructed to reflect the insurance eligibility rules, was used to identify who reportedly lacked insurance from this source. An HIEU is comprised of an adult, his or her spouse, unmarried minor natural/adoptive children, children of unmarried minor children, and children up to age 24 who are full time students. If an employer reported that the employee did not have insurance, then all HIEU members were confirmed as lacking insurance through that source. If the employer reported the employee had single coverage, then the employee was confirmed as insured, and other HIEU members were confirmed as lacking insurance from that source.

Providers. Each MEPS-HC interview asks about hospital, physician, and other services received since the last interview, including physicians' and hospitals' names and contact information. The MEPS Medical Provider Component (MPC) is a follow-back survey of those providers. For services received in 1996, the MEPS-MPC, was fielded in the second half 1997, when the vast majority of insurance claims from 1996 had likely been paid (Griffen and Powell 2006). Each hospital and physician's office reported events, charges, payments, and other information. To avoid confounding the dynamics of insurance status with misreported insurance, the unit of analysis is person-months: if any provider reported that private or public insurance paid for a person's visit or stay during the month, then this provides evidence that the person was insured. If all providers visited during the month reported no insurance paid for care, then this indicates the person was uninsured. Consistent with the definition of insurance used in the HC, workers compensation, veterans benefits, and other forms of partial coverage are not considered to be insurance. Providers may not, however, perfectly report source of payment information, and efforts to find these types of problems are described in the methods section.

Analytic Samples
The key analytic samples consist of either persons with data from all relevant employers and insurance companies or person-months with data from all hospitals and physicians used during the month. Information from all potential sources of private insurance was needed to show someone who reportedly had private coverage lacked it. For example, if one establishment did

not respond, and all other establishments reported the person lacked insurance, then the nonresponding establishment could be the source of insurance. Similarly, if the sample member reported lacking insurance, then this could be confirmed only when all providers confirmed insurance did not pay for care.

Several factors limiting the sizes of the analytic samples are shown in Table 1. For the uninsured, provider data were available for only the small fraction of person-months in which hospital or physician services were used. Similarly, to validate the lack of private insurance required data from employers and other sources of private insurance, so the analysis was on individuals who resided with at least one HIEU member who was employed or privately insured at the first interview. While this was most of those reportedly lacking private insurance, one cannot assess accuracy among those without an employed family member or private insurance at the first interview, which may limit the generalizeability of the results.

Each relevant establishment had to be eligible for the follow-back surveys, permission forms had to be signed for each, and all the establishments had to respond. The MEPS sought sample members' permission to contact many but not all employers, insurers, and providers. In particular, permission to contact office-based physicians was not sought for a randomly selected subset of HC sample members (Machlin and Taylor 2000). Some HC sample members did not sign the permission forms, so the analytic samples may have more compliant sample members. Many establishments did not respond to the follow-back surveys. Employer and insurer nonresponse especially limits sample size (Cooper et al. 1999).[10] There may be systematic differences between the employers that did and did not respond. In addition, sometimes the provider data could not be used, because the provider reported visits or stays were in different months than those reported by the family respondent. The resulting samples are 1,658 individuals privately insured in July, 600 lacking private insurance, and 426 lacking any insurance (Table 1). Data from all providers were available for 1,134 uninsured person-months. Because the analytic samples are small, nonrandom subsamples, methods for assessing the impact of sample selection on the generalizeability of the results are described below.

Larger samples with only limited corroboration of insurance status were used for additional descriptive statistics. All 11,913 sample members privately insured at the first interview were asked for insurance cards, and this is a sample used to assess validation using insurance cards. A slightly smaller sample of those for whom policy booklets were sought (N=11,159) was used to assess validation from that source. Data from at least one employer or insurer were available for 4,765 individuals privately insured in July and 1,267 lacking private insurance in July, including 924 lacking any insurance (Table 1). Data from at least one provider were available for 1,606 uninsured person-months.

Hypotheses and Statistical Methods

The four analyses conducted in this study share common statistical methods, methods for accounting for nonresponse, and hypotheses about factors potentially affecting disagreements across sources of insurance information. The analyses differ, however, in the validation data, samples, and units of analysis.

Nonresponse Analysis
Results from the analytic samples may not be generalizeable, because if only the most compliant have validation data, then estimates from the analysis would overestimate the rate of agreement in the full sample. The characteristics of sample members with and without data from all establishments were compared. Difference-in-means and chi-squared tests were used to assess any sample selection bias on socioeconomic characteristics; employer size, which was related to employer nonresponse; type of provider, which is used to determine eligibility for the provider survey; and two measures of respondent compliance. One is a measure of respondent compliance with the survey record-keeping tasks. Prior to the first interview, households were mailed calendars to use to record all health care service use. Respondents to the first interview who recorded all the family's health care use in the calendar were more compliant (Sanchez 1993).[11] The second measure is a binary variable for whether the person subsequently ceased participating in the second year of the MEPS. These measures may indicate the underlying propensity to comply. Using measures of compliance is an innovation for the validation literature. In addition, variables used to assess differences in factors potentially related to accurate reporting, described below in this section, are analyzed.

Validation
Family reports were compared with information from the other sources using descriptive statistics. To further evaluate the role of nonresponse, validation on the analytic samples was compared with partial validation from employers and providers on larger samples. Low levels of disagreement are to be expected for any survey, because even without reporting error there might be, for example, haphazard data entry errors for the validation data leading to incorrect estimates of validation rates.

Regression Analysis of Potential Factors Associated with Accurate Reporting

Regression methods were used to assess factors related to accurate reporting by families, employers, and providers. Because sample sizes are small and the number of respondents with disagreements is also small (Table 2), the regressions include only characteristics for which mean values differed between the analytic and full samples or were found to be important in other studies (race, ethnicity, and income). In addition to socioeconomic, employer, and provider characteristics, five factors were assessed: (1) family recall, (2) complex and large families, (3) partial insurance coverage, (4) Medicaid benefit and eligibility rules, and (5) employer recall.

Family Recall. Family reporting errors may occur when there is a longer lag between the interview and July, so this time lag is measured in months. Note, however, the mean lag is less than 3 months, so this may not be much of a problem (Table 3).

Complex and Large Families. Respondents may be more likely to make errors reporting on the insurance status of someone outside the nuclear family or HIEU. A variable indicates whether the sample member was not in the respondent's HIEU. I also included a second variable measuring family size, which may reduce reporting accuracy if the respondent forgets to report on some family members or because larger families have longer interviews, which may reduce the respondent's concentration.

For the analyses of uninsurance, a more direct test of recall and respondents' overlooking family members was also used. A variable measures whether the uninsured sample member or any other family member reportedly had insurance at some time during the reference period of the interview. For the comparison of family and employer reports, the variable measures reported private insurance. For the comparison of family and provider reports, the variable measures reported private or public insurance, because providers could report payments from any source. If recall or overlooking a family member were problems, then these variables would be associated with disagreements between sources.

Partial Insurance Coverage. Partial insurance coverage may help explain discrepancies with employers, insurance companies, and providers. Among the reportedly uninsured in July 1996, 1.6% reportedly had only single service plans, especially dental insurance (Table 3). Sample members who have only single service plans are considered uninsured. A binary variable indicates the family respondent reported the sample member had only single service coverage. When the family reported limited coverage and a hospital or physician reports insurance payments, it is unlikely the sample member's private dental insurance paid for hospital or physician services. Instead, it is more likely the family respondent did not correctly report the extent of coverage.

Three more types of partial insurance were investigated in the analysis of insurance payments for those who reported lacking insurance: state programs with limited benefits, workers compensation, and automobile insurance. In these cases, the person may correctly report lacking insurance even though the provider was paid. Examples of state programs with limited benefits include programs assisting with prescription medications; for specific conditions, such as the kidney disease and Human Immodeficiency Virus (HIV); and limited benefits for people receiving general assistance cash benefits. These programs typically serve small populations or the elderly. A binary variable indicates whether the sample member reported having coverage from only these state programs. Only 1% of nonelderly uninsured service users reported having only these limited benefits (Table 3). Another binary variable indicates the person had an accident or injury while at work or involving a motor vehicle. Care for these injuries could be paid by workers compensation or auto insurance, but providers might report these payments as private insurance, or the insurer's name may be misclassified during data entry or editing.

Medicaid Benefit and Eligibility Rules. A person also may correctly report lacking insurance even though the provider was paid due to complex Medicaid benefit and eligibility rules. First, Medicaid enrollees with partial benefits, particularly those with coverage for only pregnancy-related services, may correctly report that they lack insurance. Second, many states allow some providers to determine a woman is presumptively eligible for Medicaid (National Governors Association 1995). Under presumptive eligibility, the provider can be reimbursed by Medicaid for a short time while the woman applies for coverage. Hence, a provider may receive Medicaid payments, but a pregnant woman may not perceive herself as covered by Medicaid. To capture this possibility, a variable indicates whether the family respondent reported that the sample member was pregnant. In 1996, pregnant women were only 3.0% of the reportedly uninsured who received care from hospitals or physicians, or about 0.01% of the nonelderly population, so any discrepancies related to these rules would be extremely small (Table 3).

Many states provide Medicaid coverage to the medically needy, that is, families with children, people with disabilities, and the elderly whose health care expenditures are quite substantial relative to their incomes. States determine eligibility based on income and expenditures during a "spend down period," typically 6 months. A person's spend down period can begin

retroactively before she applies for coverage. Hence, in some circumstances, a provider could have received payment, even though services were provided before the patient enrolled in Medicaid. Two binary variables were included in the analysis: (1) the sample member resided in a state with a medically needy program, and (2) the sample member resided in such a state and was in an HIEU with children.

Employer Recall. Employers and insurers also may misreport due to recall issues: they were interviewed between August 1997 and February 1998 about the employee's or policyholder's insurance in July 1996 (Cooper et al. 1999). Because the recall period is 13 to 20 months prior to the interview, some establishment respondents might have described current insurance status rather than insurance in July 1996, despite clearly worded questions. Changes in actual insurance status between the household and establishment interviews would create the potential for reporting errors by the establishment respondent. Two factors that could change employees' enrollment decisions are changes in employment and family structure. Changes in employment are measured using a binary variable for whether any HIEU member left the current main job reported at the first interview or switched between full and part-time employment by August 1997. Changes in hours of work could be important, because eligibility for benefits is often limited to full-time employees. Most of the sample members flagged by this variable left their job. Changes in family structure are measured using a binary variable for whether any HIEU member's marital status changed or a first child was added to the HIEU between the first and fourth interviews. Other factors causing changes in actual insurance status, such as rising employee contributions and changes in employers' decisions to offer insurance, were not measured due to data limitations.

Regression Analysis. The dependent variable in each regression analysis is disagreement between the family respondent and other sources. For most analyses, relatively few observations have disagreements (Table 2). For example, among the reportedly uninsured with complete data from employers and insurance companies, only 37 observations have evidence of private coverage. Thus, I used complementary log-log regression analysis, which better accounts for the rarity of the outcome than would probit or logit regression (Long 1997). For analyses with more prevalent disagreements, probit regressions were used. Mean marginal effects were calculated using the regression coefficients and the characteristics of the estimation sample.

Extrapolation to All Nonelderly
The regression coefficients were used to extrapolate disagreement rates from the sample with validation data to the rest of the nonelderly to get a measure that is not biased by differences in measured characteristics between the analytic and full samples. These extrapolations account for measured differences in respondent compliance. When the analyses suggested employer misreports accounted for the disagreements between sources, I calculated the expected rate of overreporting in the full sample as if there were no misreporting by employers related to the lag between the household and establishment interview; that is, setting the employment and HIEU change variables to zero for all observations. These extrapolations suggest the rate of misreporting by family, rather than employer or provider, respondents in the full sample.

Standard Errors
Standard errors for mean marginal effects and predicted rates of disagreement are estimated with balanced repeated replication (BRR) methods to account for the stratification and clustering in the complex survey sample design (Wolter 1985). The analyses comparing family and provider reports uses person-months as the unit of analysis, so there is clustering on the persons as well as primary sampling units. The standard errors from BRR are somewhat conservative in accounting for the additional clustering at lower levels (Wolter 1985).

Results

Sample Selection Bias
Analytic sample members differed from their respective full samples in a few ways (Table 3). For each of the four analyses, analytic sample members were more compliant than the general population: they were more likely to record all health care use in the calendar or respond to subsequent interviews. Most socioeconomic characteristics did not differ, but there were exceptions. For example, among persons lacking private insurance, nonwhites were underrepresented in the analytic sample. For the privately insured and those lacking private insurance, employment by small employers was either under or overrepresented, respectively. For the privately insured and the uninsured, individuals with less stable employment are underrepresented in the analytic samples: analytic sample members were less likely to subsequently leave employers or change hours.

Among uninsured service users, the mix of providers used by those in the analytic sample differed from those in the full sample because data were sought from all hospitals but only a random subsample of physicians (Table 3). Those in the analytic sample were more likely to have had a work- or vehicle-related injury, perhaps because of the overrepresentation of hospital users. Analytic

sample members were less likely to report a pregnancy, and they were less likely to report participation in a state program with limited health benefits.

Privately Insured: Three Types of Validation Data
Because there is no gold standard for health insurance data, three types of validation data—employer reports, policy booklets, and insurance cards—were used to assess whether some reportedly privately insured individuals lack it. Descriptive statistics on validation are shown for larger samples before moving to the sample with data from all employers and insurers.

Most sample members had evidence of their private coverage. In the first column of Table 4, among the 11,913 nonelderly people who reported having private insurance at the first interview, 77.4% had an insurance card.[12] In the second column, among the 11,159 nonelderly people who reported having private coverage and who were eligible for policy booklet collection, 78.1% had an insurance card 55.6% had a policy booklet, 48.3% had both sources, and 85.4% had either a card or a booklet (Table 4). While 14.6% did not show a card or a booklet, the lack of an insurance card and policy booklet does not necessarily indicate a lack of insurance: hence the use of employers as an independent source of validation.

In the smaller sample of those with data from any employer or insurance company, there is evidence that reporting may be quite accurate. Two-thirds had at least one employer or insurance company report they were insured and only 6.1% had all establishments report they were uninsured (Table 4).   For the remaining 28.0% of sample members, at least one establishment reported not providing insurance, but other establishments did not respond, so there were missing data that could have validated insurance. For nearly all of these cases, either insurance cards or policy booklets were shown.   Thus, only 5.4% of the sample lacked any evidence of private insurance.

In the analytic sample of those with data from all employers and insurance companies, 97.3% (95% confidence interval of 96.0% to 98.7%) had either an insurance card, or a policy booklet, or at least one employer or insurance company reported they were insured (Table 4). The percentage with policy booklets in this sample is much higher than in the overall sample, which is consistent with the higher level of compliance with other survey activities. For 85.6% of the sample members at least one establishment reported insurance, but for 14.4% all establishments reported there was no insurance. More than half had validation from all three sources, and 88.0% had validation from two or more sources. For the 9.4% with validation from only one source, an employer or insurance company was the most prevalent source. Only 2.7% did not have an insurance card or a policy booklet, and none of the employers or insurance companies reported they had insurance.

The first two columns of Table 5 contain mean marginal effects from two regression analyses of potential false-positive responses, instances were the family reports were not validated. In the first column, the dependent variable is a binary variable for whether all establishments reported a lack of private insurance covering the sample member. Low-income people reporting private insurance were 9.3 percentage points more likely to have their establishments report they had no insurance than those with higher incomes. As expected, changes in employment and HIEU structure appear to play a large role in disagreements between respondents. Compared with sample members with stable family employment, those for which any HIEU member was no longer at their employer from the first interview or switched between full and part time hours were 6.7 percentage points more likely to have disagreements. Compared with sample members with stable families, those for which any HIEU member changed marital status or the HIEU acquired its first child were 10.1 percentage points more likely to have disagreements.

In the second column, the dependent variable is a binary variable for whether there was a lack of validation from any source: establishments, insurance cards, or policy booklets. Compared with sampled members in the respondent's HIEU, those not in the respondent's HIEU were more likely by 6.5 percentage points to lack validation from any source. Changes in employment were associated with disagreements. The small number of sample members with no validation from any source, 47, may contribute to the difficulty detecting other factors correlated with the lack of any evidence of reported private insurance.

Using the regression results to project the probability of misreporting to all reportedly privately insured nonelderly suggests that 84.2% (95% confidence interval of 80.5% to 87.8%) would be validated by at least one establishment, and 97.3% (95% confidence interval of 94.1% to 98.4%) would be validated by any source. These results are quite similar to those from the much smaller analytical sample for several reasons. Few characteristics differ appreciably between samples, and among the characteristics that differ, few have large effects on validation. The exception is having an HIEU member with less stable employment, which is less prevalent in the analytic sample (Table 3) and is associated with disagreements between employer

and family respondents and a lack of insurance cards and policy booklets (Table 5). While members of the analytic sample were more compliant, compliance was not associated with more accurate reporting.

If all family members had stayed at their employers and HIEU structure had not changed, then the predicted validation rates would be higher: 87.8% (95% confidence interval of 84.3% to 91.3%) from any establishment and 98.0% (95% confidence interval of 96.6% to 99.3%) from any source.[13] This suggests that employer misreporting due to the time lag between the household and employer interviews is a source of discrepancies in between these two sources.

Some corroborating evidence suggests that family respondents' actual rate of correct reporting is likely closer to 98% than 88%, and the rate of incorrect reporting is likely closer to 2% than 12%. First, the regression analysis may not have fully accounted for establishment respondents reporting insurance status at the time of the establishment interview, rather than insurance status in July. In the regression, two factors related to changes in actual insurance were associated with disagreements between family and employer and insurance company respondents. But two more factors that might cause changes in actual insurance status were not in the regression: (1) changes in employee contributions and benefits, and (2) establishments that ceased offering coverage. The establishments were asked about insurance at only one time period. Second, among those in the analytic sample for whom all employers said they lacked coverage, 54% provided both insurance cards and policy booklets. It seems unlikely these respondents would be both organized enough to save documents and provide them to interviewers and yet disorganized enough to not realize that their coverage had ended. Reports corroborated by only an insurance card or only a booklet, another 27%, however, might have less credibility. Third, even in the second regression, which counted the fewest cases as disagreements, employment changes are associated with lacking evidence of private insurance. This result suggests that establishment errors account for some of the disagreements even when additional evidence (cards and booklets) is used, and that household errors might be even less than 2%. Alternatively, employment instability could be correlated with family respondents' errors.

Not Privately Insured: Employer and Insurance Company Reports
This analysis used employer reports to study whether some of those who reported lacking private insurance may have been incorrect. Within the sample with data from any employers or insurance companies, 92.2% (95% confidence interval of 89.5% to 94.9%) had at least one establishment report they did not have private insurance from that source, including 50.7% who had all establishments report they lacked private insurance (Table 6). On the other hand, 7.8% (95% confidence interval of 5.1% to 10.5%) had at least one employer or insurance company report the person was insured. In the smaller sample with data from all employers and insurance companies, 91.2% (95% confidence interval of 88.9% to 94.6%) had all establishments report they lacked private insurance, and 8.8% (95% confidence interval of 5.4% to 12.1%) had at least one establishment report they had private insurance.

Among the marginal effects from the complementary log-log regression analysis, shown in the third column of Table 5, three factors are statistically significantly associated with disagreements between families and private establishments. Nonwhites were more likely, by 8.8 percentage points, than whites to accurately report their lack of private insurance. Changes in employment were associated with disagreements. Individuals reportedly having single service coverage were more likely, by 57.1 percentage points, to have disagreements between families and employers. While either the family or establishment respondent could incorrectly report the extent of coverage, evidence from the establishment survey suggests the family would be the predominate source of errors. No employers reported employees choosing only single service plans, and insurance companies reported only two nonelderly individuals had only partial coverage (dread disease and single service).[14] The follow-back survey did not, however, collect information from insurance companies from which single service and dread disease plans were purchased, so the extent of misreporting about plans with limited benefits could not be assessed.

Using the regression results to project the probability of misreporting to all reportedly uninsured nonelderly persons suggests that 92.2% (95% confidence interval of 89.1% to 95.3%) would be validated by all establishments, and 7.8% (95% confidence interval of 4.7% to 10.9%) would have at least one establishment report the person had insurance. These predictions suggest only slightly better agreement than that found in the much smaller analytical sample.

The next predictions remove employer misreporting due to the time lag between the family and employer interviews. If all family members had stayed at their employers, then the predicted validation rate would be higher: 95.2% (95% confidence interval of 93.0% to 97.5%) from any establishment.

Uninsured: Employer and Insurance Company Reports

This analysis was very similar to the analysis of individuals not reporting private insurance, except that I examined employer and insurance company reports of private insurance among those the respondent reported lacked any insurance. Within the sample with data from any employers or insurance companies, 90.7% (95% confidence interval of 87.4% to 94.0%) had at least one establishment report they did not have private insurance from that source, including 49.1% who had all establishments report they lacked private insurance (Table 6). On the other hand, 9.3% (95% confidence interval of 6.0% to 12.6%) had at least one employer or insurance company report the person was insured. In the smaller analytic sample with data from all employers and insurance companies, 89.4% (95% confidence interval of 85.1% to 93.8%) had all establishments report they lacked private insurance, and 10.6% (95% confidence interval of 6.2% to 14.9%) had at least one establishment report they had private insurance.

The marginal effects from the complementary log-log regression, shown in the fourth column of Table 5, are qualitatively very similar to those from the previous analysis, shown in the third column. The primary difference is the larger standard errors associated with the smaller sample size. Nonwhites were more likely, by 10.3 percentage points, than whites to accurately report their lack of insurance. Those who reported having single service coverage were more likely, by 56.5 percentage points, to have employers report they were insured. Contrary to the hypothesis, when the sample member was not in the respondent's HIEU, there was less disagreement between the family respondent and the employers.

Using the regression results to project the probability of misreporting to all reportedly uninsured nonelderly suggests that 89.8% (95% confidence interval of 85.3% to 94.4%) would be validated by all establishments, and 10.2% (95% confidence interval of 5.6% to 14.7%) would have at least one establishment report the person has insurance. These projections show about the same level of disagreement than found in the much smaller analytical sample.

About 1.0 percentage point of the 10.2% of the uninsured predicted to have disagreements in reported insurance status may be due to family respondents reporting single service plans. This estimate is the difference between the predicted probability of validation if no one reported single service plans and the predicted probability of validation with their actual reports. The problem of misreported type of private coverage may be unique to the MEPS and National Health Interview Survey, because the CPS and SIPP, do not attempt to determine the services covered.

Uninsured Service Users: Provider Reports

This analysis used provider reports to study potential insurance underrreporting among sample members who received physician or hospital-based services. I analyzed person-months to avoid confounding the dynamics of insurance status with misreported insurance.

Among nonelderly uninsured person-months with hospital or physician use and data from any providers, 66.2% (95% confidence interval of 60.9% to 71.5%) had at least one provider report they did not receive insurance payments, including 48.4% who had all providers report they did not receive insurance payments (Table 6). On the other hand, 33.8% (95% confidence interval of 28.5% to 39.1%) had at least one provider report receiving insurance payments for services. In the smaller sample with data from all providers, 69.5% (95% confidence interval of 64.0% to 75.0%) had all providers report they lacked insurance, and 31.5% (95% confidence interval of 25.0% to 36.0%) had at least one provider report they had insurance. Among those whose providers reported insurance payment, 73% reported payments from private insurers, 22% reported payments from Medicaid, and Medicare and CHAMPUS accounted for the rest. The preponderance of private insurance payments is consistent with private insurance being the primary source of insurance in the nonelderly population. More than half of the disagreements were among those with incomes more than twice the poverty line, and for this group private insurance accounted for 85% of reported payments. Among those with incomes less than twice the poverty line, private insurance accounted for 59% of payments and Medicaid for 39%, while among low-income, reportedly insured individuals, Medicaid covered nearly half the population. Perhaps some provider reports are Medicaid managed care plans reported as private insurance. Nonetheless, most of these details point to more problems reporting private insurance than public insurance.

Among the marginal effects from the probit regression analysis, shown in the last column of Table 4, several characteristics were statistically significantly associated with disagreements between family and provider respondents. Providers for uninsured pregnant women and children, and for those reporting only limited benefits through a state program, were much more likely to report insurance paid for services. Program with limited benefits and presumptive eligibility for pregnant women could cause discrepancies between family and provider reports that are consistent with accurate reporting by both sources. The coefficients on private single service coverage and work- and auto-related injuries are large but not statistically

significant, with inconclusive implications for whether providers report workers compensation and automobile insurance as private hospital/physician insurance. Each additional month between the date care was received and the household interview increased disagreement by 2.5 percentage points. Contrary to expectations, there was much more agreement for family members who were not in the respondent's HIEU. There was more disagreement about coverage of children than adults, but the source of the problem is not clear, because no other coefficients indicate respondents forget to report coverage for some family members.[15] Low income sample members had more agreement with providers about insurance than sample members in families with incomes more than twice the poverty line. This is a potential reason why providers report more private insurance payments for the uninsured: individuals with higher income are more likely to have errors and have private insurance.

Using the regression results to project the probability of misreporting to all reportedly uninsured nonelderly who used services suggests that 69.4% (95% confidence interval of 64.6% to 74.2%) would be validated by all providers, and 30.6% (95% confidence interval of 25.8% to 35.4%) would have at least one establishment report the person has insurance. These results are very similar to those from the much smaller analytical sample, because the marginal effects of the characteristics that difference between the samples are generally not statistically significant.

The agreement rate between families and providers was simulated without the legitimate discrepancies related to pregnancies and state programs with limited benefits. Under this assumption, the agreement rate would rise slightly to 70.1%, with a 95% confidence interval of 65.4% to 74.9%. Too few sample members report limited state programs or pregnancy for these to account for more than a small portion of the disagreements. Eliminating recall by asking only about the present might raise the agreement rate by 5.6 percentage points. Most of the disagreement, however, is not explained by the factors studied.

Conclusion

Using a variety of validation data, reported private insurance and lack of insurance in the MEPS-HC was found to be reasonably accurate. Reported private insurance in a specific month appears to be highly accurate. Accounting for differences in survey compliance between individuals in small validation samples and the privately insured population, among persons who reportedly had private insurance, 98% were predicted to have evidence of their insurance, and 95% of those who reportedly lacked private insurance have evidence they did not have it. Combining these two analyses suggests families and employers and insurance companies would agree on private insurance status for 97% of the nonelderly[16] and about 2% of the truly privately insured did not report their private insurance.[17] Thus, private insurance appears to be reported much more accurately than public coverage, because studies benchmarking Medicaid enrollment estimates from the MEPS with administrative data suggest 12% to 15% of Medicaid and SCHIP enrollees do not report these sources of coverage in the MEPS-HC (Banthin and Sing, forthcoming; Nelson 2003; Peterson and Grady 2005).

Reported lack of insurance is difficult to validate, and this study contained two analyses of underreporting insurance. Accounting for differences in survey compliance between individuals in small validation samples and the privately insured population, among reportedly uninsured people, 10% were predicted to have private insurance according to the employers and insurance companies. Among reportedly uninsured people who received hospital or physician services during a month, 30% would have providers report insurers paid for services. According to providers, most of this was underreported private insurance (73%), rather than Medicaid (22%), and a detailed examination of the data supports providers' reports. Service use among the reportedly uninsured was infrequent, so the estimate from provider reports applies to at most 11.0% of the uninsured in any month. Hence, the two estimates are not contradictory, and about 8% of the reportedly uninsured who did not use services may have been actually privately insured.[18] Nonetheless, much of the disagreement about insurance coverage, especially between providers and service users, remains unexplained.

For reports of private insurance, the MEPS-HC appears to have accuracy similar to the BRFSS and somewhat better than the 1977 NMCES. Using a similar methodology for the 1977 NMCES, Walden et al. (1984) found that among people reportedly lacking private insurance, 12% had their family members' employers report coverage, which is worse than the 5% estimate from the MEPS. Walden and colleagues also found that 99% of those reporting private insurance had it, which is similar to the estimate of 98% from the MEPS-HC. Evidence from the MEPS-HC suggests that about 2% of those with private coverage did not report it. This is similar to the rate of 6% Nelson et al (2000) found in their study of the BRFSS. However, the estimate from the MEPS-HC suggests less accuracy that obtained by the Minnesota Tobacco Survey (Davern et al. 2005), in which 0.6% of the privately insured did not report their coverage.

The impact of errors in reported private insurance on estimates of the uninsured is small. If every reportedly privately insured person who actually lacked private insurance also lacked public coverage, then the rate of uninsurance among the nonelderly may be overstated by about 0.6 percentage points (from a baseline of 19.3% in July, 1996).[19] This is in addition to any overestimate of uninsurance due to errors in reporting Medicaid, which in three state surveys may range from 0.5 to 1.3 percentage points and may be higher in the CPS (Call et al. 2007b; Callahan and Mays 2005; Giannarelli et al. 2005; Nelson 2003).

The findings have four important limitations. First, the data are not linked to administrative data to validate reported public insurance and, more importantly, confirm reported lack of public insurance. Second, employers, insurance companies, and providers may all err in reporting insurance, and the analyses found evidence suggesting recall errors by employers' and insurance companies' respondents. The analyses attempted to overcome these limitations by presenting alternative estimates based on four types of validation data and by using regression analyses to account for factors related to errors from each source. The analyses could not, however, completely compensate for the lack of a gold standard for assessing insurance status. Third, the samples for the regression analyses were small and not representative in some respects. In particular, individuals in the analytic sample were more compliant with survey activities than were those in the full sample. To compensate for this limitation, the regression coefficients were used to predict population agreement rates. However, if the measures of compliance did not fully capture the differences between samples, then the results may overstate the true level of agreement. Analytical methods could not, however, compensate for the limited power to detect factors causing disagreements between families and other sources. Most plausible factors are relevant for only small fractions of the population, and large sample sizes would be needed to detect their influence. Fourth, the data predate SCHIP.

The MEPS-HC is an important source of national estimates of insurance coverage, especially estimates of the length of time individuals have or lack insurance. The high level of accuracy in reporting insurance status supports using the MEPS-HC to track trends and analyze polices.

Endnotes

1   Similarly, some respondents to the American Community Survey report current welfare and food stamp receipt rather than receipt over the past 12 months (Lynch 2006; Resnick et al. 2007).
2   Call et al. (2001), however, found higher underreporting, but they used the Minnesota Health Access Survey, which did not ask about Medicaid if the person reported Medicare, military programs, veterans programs, and the Indian Health Service.
3   Similarly, Cohen and Martinez (n.d.) found that adding state program names to the NHIS increased reported Medicaid and SCHIP coverage.
4   Note that pregnant women with children and sufficiently low income are eligible for full Medicaid benefits. Only those without children or with somewhat higher income are eligible for only pregnancy-related services.
5   After the State Children's Health Insurance Program was enacted, it was added to the MEPS.
6   These sources of coverage were 99% of the reportedly insured, nonelderly population, and the remainder reported only Champus (now called Tricare) or Champva.
7   Booklets were returned after they were photocopied.
8   The follow-back survey excluded federal employers, the self-employed with no employees, and employees who were the only employee in their establishment.
9   For two-person adult-adult coverage, the spouse's reported insurance was validated. When the establishment reported two-person adult-child coverage, and the family respondent reported only one child dependent, then the child's reported insurance was validated. When the family respondent reported one covered dependent and other members not covered through the establishment, then insurance was validated for the covered member. In 16 cases, the family respondent reported multiple children had coverage, and I arbitrarily assumed the coverage of the oldest child was validated by the establishment and the reports for the others were contradicted.
10 The (weighted) percent of eligible persons in families with completed permission forms for all employers and insurers was: 55% among the privately insured and 56% among those lacking private insurance. Among those with completed

permission forms, the percent of persons in families with responses from all establishments was 22% for the privately insured and 33% of those lacking private insurance. Among uninsured service user person-months, 56% either used only hospital services or were selected for data collection from physicians. Among these, 79% signed permission forms for all hospitals and physicians from which services were received during the month. Among those with signed permission forms for all providers, 48% had complete data from all providers.

11 When the respondent volunteered without prompting that there was no service use to record, I coded this as compliant. This avoids confounding this measure of compliance with service use and hence insurance status.

12 Insurance cards were shown for similar percentages of those reportedly covered by Medicaid and Medicare.

13 In the regression for validation from any source, the coefficient on employment changes is significant but not the coefficient on changes in HIEU structure, so only employment changes are set to zero in the simulation.

14 These two cases were coded as all employers and insurers reported no insurance.

15 The data are from 1996, before the establishment of the presumptive eligibility option in the State Children's Health Insurance program, so that cannot explain the disagreements, and, in fact, providers were as likely to report private insurance payments for children as for adults.

16 P(Agreement) = P(Reportedly privately insured) × P(truly privately insured |reportedly privately insured) + P(reportedly not privately insured) × P(truly not privately insured |reportedly not privately insured) = .691 × .980 + (1 - .691) × .952.

17 P(truly privately insured) = P(reportedly privately insured) × P(truly privately insured |reportedly privately insured) + P(reportedly not privately insured) × P(truly privately insured |reportedly not privately insured), and P(reportedly not privately insured |truly privately insured) = P(reportedly not privately insured) × P(truly privately insured |reportedly not privately insured) ÷ P(truly privately insured) = (1 - .691) × .048 ÷ [.691 × .980 + (1 - .691) × .048].

18 Among the reportedly uninsured, that is, implicitly conditional being reportedly uninsured, P(Privately insured | received care) = P(private insurance payments | received care & payments made) × P(payments made | received care) = .73 × .299, and P(Privately insured | did not receive care) = [P(Privately insured) - P(Privately insured | received care) × P(received care)]/P(did not receive care) = [.102 - .73 × .299 × .110]/(1 - .110).

19 Assuming all the reportedly privately insured contradicted by establishments are uninsured, P(Uninsured) = P(Reportedly privately insured) × P(truly not privately insured |reportedly privately insured) - P(reportedly uninsured) × P(truly privately insured |reportedly uninsured) = .691 × .020 - .198 × .102.

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Table 1. Sample Selection for Four Analyses of Validation Data

Population	Privately Insured	Not Privately Insured	Uninsured	Uninsured Service Users
Validation Data	Insurance cards, policy booklets, employers and insurers	Employers and insurers	Employers and insurers	Providers
Unit of Analysis	Persons	Persons	Persons	Person-Months
Full Sample	11,913	6,870	4,079	48,832
Any Employed or Privately Insured HIEU Member		4,627	3,292	
Service Users [a]				5,204
Permission Forms to Contact Establishments				
Sought for all establishments	8,546 [b]	3,401 [b]	2,427 [c]	3,002 [c]
Signed for all establishments	5,448	1,837	1,260	2,418
All Establishments Responded	1,658	600	426	1,328
All Providers Responded and Event Date Matched [d]				1,134

SOURCE: Medical Expenditure Panel Survey Household Component, linked Insurance Component, and Medical Provider Component (MPC), 1996. Persons under age 65.

NOTES: HIEU = health insurance eligibility unit, comprised of an adult, his or her spouse, unmarried minor natural/adoptive children, children of unmarried minor children, and children up to age 24 who are full time students.

[a] Hospital stays or visits to office-based physicians, emergency departments, or hospital outpatient clinics.
[b] The MEPS did not seek to conduct follow-back interviews for policyholders residing elsewhere, federal employees, the self-employed with no employees, or when the sample member was the only employee at the establishment.
[c] The MPC excluded some physicians. Hospitals were sampled with certainty, but office-based physicians were followed for a randomly selected subset of HC sample members.
[d] Excluding person-months with (1) any stays and visits reported by the provider and household to have occurred in different months, or (2) any stays and visits for which the provider reported they had not been paid by an insurer but they expected to be paid or had discounted the fee under an insurance agreement. These cases could not refute reported uninsurance with certainty.

Table 2. Number of Observations with Agreement and Disagreement in Reported Insurance Status for Four Analytic Samples

Population	Privately Insured	Not Privately Insured	Uninsured	Uninsured Service Users
At Least One Establishment Agreed	1,414			
All Establishments Disagreed	246			
At Least One Establishment Agreed or an Insurance Card or Policy Booklet Was Shown	1,611			
No Evidence of Private Insurance: All Establishments Disagreed and No Insurance Cards or Policy Booklets Were Shown	47			
All Establishments Agreed		559	389	798
At Least One Establishment Disagreed		41	37	336
N	1,658	600	426	1,134 [a]

SOURCE: Medical Expenditure Panel Survey Household Component, linked Insurance Component, and Medical Provider Component, 1996. Persons under age 65.

[a] Person months.

Table 3. Characteristics of Members of Full and Analytic Samples

	Privately Insured		Not Privately Insured		Uninsured		Uninsured Service Users	
	Full Sample	Analytic Sample	Full Sample	Analytic Sample	Full Sample	Analytic Sample	Full Sample	Analytic Sample
Sample Members' Characteristics (percent)								
Nonwhite	14.4	12.4	28.8	21.3***	24.4	20.6	20.9	22.4
Hispanic	7.3	6.3	22.1	22.2	22.4	20.8	16.6	15.8
Female	50.4	49.1	49.7	49.0	46.7	47.5	57.1	58.3
Child	28.4	25.1***	35.5	32.4	25.4	25.7	23.7	25.1
Region								
Northeast	20.2	17.3†	17.9	10.5††	16.2	11.7	17.2	17.1
Midwest	25.5	27.1	17.8	18.6	17.4	18.9	20.3	20.5
South	33.1	30.6	38.8	43.4	40.6	44.9	42.1	45.0
West	21.3	25.1	25.7	27.4	25.7	24.5	20.5	17.4
Urban	76.2	76.9	71.3	67.4	70.2	66.6	71.8	66.7**
Used Hospital Services							22.3	36.4***
Family Income Less Than Twice the Poverty Line	17.0	16.4	67.6	66.1	58.0	59.9	56.8	56.1
Respondents' Characteristics								
Sample Member Not in Respondent's HIEU (percent)	6.4	5.3*	16.6	12.9**	20.1	13.9***	12.8	11.4
Education (years)	13.5	13.5	11.4	12.0***	11.7	12.1*	11.9	12.0
Recorded All Events in Calendar (percent)	56.8	63.4***	38.8	43.7	40.9	46.5	43.5	47.7*
Did Not Respond To 4th or 5th Interview (percent)	12.1	8.2***	9.1	5.5**	9.6	5.4**	10.5	9.1
Other Factors Affecting Respondent Reports								
Months between July and Interview	2.5	2.3***	2.5	2.4	2.5	2.4	2.3	2.3
Number of Family Members	3.28	3.02***	3.67	3.42*	3.47	3.27	3.08	3.24
Any HIEU Member Had Private Insurance (percent)			30.0	28.1	35.8	28.3**		
Any HIEU Member Had Insurance (percent)							52.7	59.1***
Employer Characteristic (percent)								
Any HIEU Member's Employer Had <50 Employees	34.7	25.2***	36.3	46.0***	43.3	48.6		

	Privately Insured		Not Privately Insured		Uninsured		Uninsured Service Users	
	Full Sample	Analytic Sample	Full Sample	Analytic Sample	Full Sample	Analytic Sample	Full Sample	Analytic Sample
Factors Affecting Employer Response (percent)								
Any HIEU Member No Longer Employed at Same Employer or Switched Between Full and Part Time	38.0	26.7***	39.7	42.3	45.9	40.8***		
Change in HIEU Structure	9.2	9.4	15.2	15.2	13.7	14.6		
Partial Insurance and Complex Eligibility (percent)								
Single Service Coverage			1.2	2.7	1.6	3.6	2.2	2.6
Limited State Program							1.0	0.4*
Work- or Vehicle-Related Injury							8.9	11.5**
Pregnant							3.0	2.1*
State Medicaid Program Has Medically Needy Eligibility							82.6	84.8
Family with Children in State with Medically Needy Program							24.8	27.7
N	11,913	1,658	6,870	600	4,079	426	5,204 [a]	1,134 [a]

SOURCE: Medical Expenditure Panel Survey Household Component, linked Insurance Component, and Medical Provider Component, 1996. Persons under age 65.

NOTES: HIEU = health insurance eligibility unit, comprised of an adult, his or her spouse, unmarried minor natural/adoptive children, children of unmarried minor children, and children up to age 24 who are full time students.

[a] Person months .

* Statistically different from the full sample at the .10 level, two-tailed test.
** Statistically different from the full sample at the .05 level, two-tailed test.
*** Statistically different from the full sample at the .01 level, two-tailed test.
[†] Distribution statistically different from the full sample at the .10 level.
[††] Distribution statistically different from the full sample at the .05 level.

Table 4. Validation of Reported Private Insurance

	Reportedly Privately Insured [a]	Eligible for Policy Booklet Collection [b]	Data from Any Employer or Insurer [c]	Data from All Employers and Insurers [d]
Insurance Cards	77.4	78.1***	82.2***	82.0***
Policy Booklets		55.6	65.9†††	73.0†††
At Least One Employer or Insurer Agreed			65.9	85.6
All Employers and Insurers Disagreed			6.1	14.4
Some Employers and Insurers Disagreed, No Data from Others			28.0	
All Three Sources Validated			42.0	55.4
Two Sources Validated		48.3	35.5	32.6
One Source Validated	77.4	37.1	17.1	9.4
None	22.6	14.6	5.4	2.7
N	11,913	11,159	4,765	1,658

SOURCE: Medical Expenditure Panel Survey Household Component and linked Insurance Component, 1996. Persons under age 65.

[a] At the first interview.
[b] At the first interview, but not through a policyholder residing elsewhere or through federal employment.
[c] Data from any employers of family members in July, or from employers, unions or insurance companies reportedly providing insurance in July.
[d] Data from all employers of family members in July, and from employer, unions, and insurance companies reportedly providing insurance in July.

*** Statistically different from all reportedly privately insured at the .01 level, two-tailed test.
††† Statistically different from all eligible for booklet collection at the .01 level, two-tailed test

Table 5. Marginal Effects on the Probability of Disagreement

	Privately Insured		Not Privately Insured	Uninsured	Uninsured Service Users
	All Employers and Insurers Disagreed	No Evidence of Private Insurance	Any Employer or Insurer Disagreed	Any Employer or Insurer Disagreed	Any Provider Disagreed
Sample Members' Characteristics					
Nonwhite	-0.028	0.035	-0.088***	-0.103***	0.023
	(0.034)	(0.025)	(0.024)	(0.033)	(0.067)
Hispanic	0.055	0.006	0.014	0.022	0.057
	(0.051)	(0.018)	(0.053)	(0.067)	(0.060)
Child	0.006	0.006	-0.017	-0.018	0.138**
	(0.019)	(0.006)	(0.033)	(0.036)	(0.070)
Family Income Less Than Twice the Poverty Line	0.093**	0.029	-0.021	-0.013	-0.139***
	(0.041)	(0.022)	(0.037)	(0.051)	(0.043)
Used Hospital Services					-0.056
					(0.037)
Respondents' Characteristics					
Sample Member Not in Respondent's HIEU	0.015	0.065*	-0.053	-0.076*	-0.133**
	(0.046)	(0.038)	(0.033)	(0.044)	(0.057)
Recorded All Events in Calendar	0.012	0.003	0.021	0.022	0.033
	(0.027)	(0.012)	(0.036)	(0.046)	(0.050)
Did Not Respond To 4th or 5th Interview	-0.042	0.022	-0.103	0.109	0.096
	(0.044)	(0.040)	(0.114)	(0.154)	(0.100)
Other Factors Affecting Respondent Reports					
Months between July and Interview	0.003	-0.001	-0.002	-0.009	0.025***
	(0.013)	(0.007)	(0.014)	(0.017)	(0.009)
Number of Family Members	0.008	0.000	-0.003	-0.004	0.025
	(0.011)	(0.005)	(0.011)	(0.013)	(0.017)
Any HIEU Member Had Private Insurance			0.076	0.061	
			(0.055)	(0.075)	
Any HIEU Member Had Insurance					0.022
					(0.043)
Employer Characteristic					
Any HIEU Member's Employer Had <50 Employees	0.053	-0.024	0.040	0.039	
	(0.034)	(0.020)	(0.040)	(0.047)	

	Privately Insured		Not Privately Insured	Uninsured	Uninsured Service Users
	All Employers and Insurers Disagreed	No Evidence of Private Insurance	Any Employer or Insurer Disagreed	Any Employer or Insurer Disagreed	Any Provider Disagreed
Factors Affecting Employer Response					
Any HIEU Member No Longer at Same Employer or Switched Between Full and Part Time	0.067*	0.037*	0.077*	0.085	
	(0.038)	(0.020)	(0.042)	(0.054)	
Change in HIEU Structure	0.101*	0.007	-0.002	-0.017	
	(0.057)	(0.015)	(0.044)	(0.066)	
Partial Insurance and Complex Eligibility					
Single Service Coverage			0.571***	0.565***	0.240
			(0.151)	(0.167)	(0.194)
Limited State Program					0.518***
					(0.187)
Work- or Vehicle-Related Injury					0.112
					(0.086)
Pregnant					0.243**
					(0.109)
State Medicaid Program Has Medically Needy Eligibility					0.052
					(0.054)
Family with Children in State with Medically Needy Program					0.026
					(0.056)
N	1,658	1,658	600	426	1,134[a]

SOURCE: Medical Expenditure Panel Survey Household Component, linked Insurance Component, and Medical Provider Component, 1996. Persons under age 65.

NOTE: Mean marginal effects calculated using coefficients from from probit regressions in the first and last columns and complementary log-log regressions in the remaining columns. HIEU = health insuran ce eligibility unit, comprised of an adult, his or her spouse, unmarried minor natural/adoptive children, children of unmarried minor children, and children up to age 24 who are full time students.

[a] Person-months.

  * Statistically different from zero at the .10 level.
 ** Statistically different from zero at the .05 level.
*** Statistically different from zero at the .01 level.

Table 6. Validation of Lack of Private Insurance and Lack of Any Insurance

	Not Privately Insured		Uninsured		Uninsured Service Users	
	Data from Any Employer or Insurer [a]	Data from All Employers and Insurers [b]	Data from Any Employer or Insurer [a]	Data from All Employers and Insurers [b]	Data from Any Physician or Hospital [c]	Data from All Physicians and Hospitals [d]
At Least One Establishment Disagreed	7.8	8.8	9.3	10.6	33.8	31.5
All Establishments Agreed	50.7	91.2	49.1	89.4	48.4	69.5
Some Establishments Agreed, No Data From Others	41.5		41.6		17.8	
N	1,267	600	924	426	1,606	1,134

SOURCE: Medical Expenditure Panel Survey Household Component, linked Insurance Component, and Medical Provider Component, 1996. Persons under age 65.

[a] Data from any employers of family members in July, or from unions or insurance companies reportedly providing insurance at the first interview.
[b] Data from all employers of family members in July, and from unions, and insurance companies reportedly providing insurance at the first interview.
[c] Payment data from any physicians or hospitals providing services in the month.
[d] Payment data from all physicians and hospitals providing services in the month.