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Counting the Uninsured Using State-Level Hospitalization Data

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SYNOPSIS

Objective. To assess the appropriateness of using state-level data on uninsured hospitalizations to estimate the uninsured population.

Methods. The authors used 1992–1996 data on hospitalizations of newborns and of appendectomy and heart attack patients in Florida to estimate the number of people in the state without health insurance coverage. These conditions were selected because they usually require hospitalization and they are common across demographic categories.

Results. Adjusted for the gender and ethnic composition of the population, the percentages of uninsured hospitalizations for appendectomies and heart attacks produced estimates of the state's uninsured population 1.6 percentage points lower than those reported for 1996 in the US Census March Current Population Survey.

Conclusion. Data reported by hospitals to state agencies can be used to monitor trends in health insurance coverage and provides an alternative data source for a state-level analysis of the uninsured population.

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The level of health insurance coverage in the population affects the lives of those with and without insurance. People without health insurance, unless they are wealthy, must cope with the uncertainty of whether they will be able to pay for their care. People with health insurance pay higher premiums to cover the costs of unpaid medical bills. And the most important cost of lack of health insurance are the health consequences when medical care is postponed for financial reasons.

State health agencies need to be able to monitor changes in the level of health insurance coverage to design policy interventions and to evaluate whether interventions are working. Knowledge of how many among us are at risk, whether the rate of uninsured people is increasing or decreasing, and the experience of specific demographic groups assist policy makers in focusing intervention strategies. For example, strategies to increase insurance coverage of individuals in their 20s may not be effective among the pre-Medicare age group in their 50s and 60s.

Uninsured rates vary widely across states and demographic groups, suggesting that national trends do not provide adequate information to state policy makers. For example, according to the US Census Bureau, state rates in 1997 ranged from 7.5% in Hawaii to 24.5% in Texas and Arizona.[1]

Current estimates of the number of uninsured are limited at the state level and nonexistent for substate populations. Data sources such as the Medical Expenditure Panel Survey, the National Health Interview Survey, and the Health and Retirement Study do not report state estimates. The US Census March Current Population Survey (CPS) provides an annual source of state-level estimates of the uninsured; however, these data have several limitations. The CPS was designed to estimate the number of people who remain uninsured for a full year. But some researchers believe that the CPS yields simply a point-in-time estimate of the uninsured given that respondents may be reporting just their current insurance status.[2] Further, CPS does not report insurance status by gender or ethnic and age categories at the state level. And analyzing trends requires adjustments of the data to account for changes in survey methodology that occur from time to time.[3] Nevertheless, the CPS is one of the most frequently cited sources of state-level estimates of the number of uninsured.

Researchers have attempted to estimate the number of uninsured in the US using a variety of approaches.[4–10] In July 1998, the State of Florida Agency for Health Care

Administration (AHCA) prepared a report on health insurance coverage in the state, using information reported by hospitals for 1992–1996 on newborns, appendectomy patients, and heart attack patients.[11] In what follows, we summarize the findings and implications of that report.

METHODS

AHCA is a state of Florida agency responsible for health quality assurance, administration of the Medicaid program, and health care research on issues pertinent to state policy. The agency has database systems that provide reliable information regarding use of health care services in the state. Hospitals report data on inpatient care to the agency quarterly; after the agency edits these reports and receives verification from the hospitals, the data are added to the AHCA hospitalization database.

We estimated the level of health insurance coverage in the state using discharge data from the AHCA hospitalization database for the years 1992–1996.

Insurance categories. We obtained the expected primary source of reimbursement for each hospitalization from discharge records for 1992–1996 reported by Florida hospitals as of September 1997.

We included patients classified as "self-pay" or "other state/local programs" such as county charity programs in the count of uninsured patients. The self-pay group included some patients with sufficient wealth to pay for any medical costs they incurred. However, these patients probably represented a small number of those in the self-pay category. In 1997, only 8.1% of US households with incomes of $75,000 or more had no health insurance coverage.[1] Some patients enrolled in "other" programs may have had ongoing insurance and were thus inappropriately classified as uninsured; however, people typically do not learn that they qualify for these programs until they are hospitalized.

Overview of uninsured hospitalizations. We first counted uninsured hospitalizations for each year from 1992 through 1996 and then, for each year, calculated uninsured hospitalizations as a percentage of total hospitalizations.

Frequently occurring conditions. AHCA assigns a Diagnosis Related Group (DRG) identifier to each hospitalization record using the Health Care Financing Administration's public domain DRG software.

Using specific indicator conditions, we estimated that 17.3% of Florida's population, or 2.5 million people, lacked health insurance coverage in 1996.

We tabulated the number of hospitalizations and uninsured hospitalizations for 1996 for the 10 most frequently occurring DRGs for each of three age groups.

Indicator conditions. We derived estimates of the percentage of people in Florida without health insurance by calculating the percentages of uninsured hospitalizations in 1992–1996 for three indicator conditions: newborns, appendectomies, and heart attacks. We selected these conditions because they almost always result in hospitalization and they are common to all ethnic groups and both sexes.

We used DRGs 385–391 to identify newborns and DRGs 164–167 to identify appendectomies. By definition, appendectomies that are coded with DRGs 164–167 exclude those performed incidental to other surgery. We identified heart attack hospitalizations using the International Classification of Diseases, Ninth Revision, principal diagnosis codes 410.0–410.9 (acute myocardial infarction) with a fifth digit ending of "1" indicating an initial episode of care. For appendectomies, we included age groups from age 0 to age 39 years. For heart attacks, we looked at patients ages 40 years and older.

We tabulated the number of appendectomies performed in 1996 for five-year age groups through age 39 to see if there were sufficient cases to allow the rate of uninsured appendectomies to be a useful indicator across age groups.

In addition, because there is more likely to be a relationship between insurance status and the likelihood of heart attacks than between insurance status and appendectomies, we compared the percentages of uninsured hospitalizations in 1996 for appendectomies and heart attacks for the 40–54 age group to see if these indicators yielded markedly different results.

Adjusted rates. To adjust for differences in hospitalization rates between genders and across ethnic groups, we first calculated the 1996 percentage uninsured for each age category by gender and ethnicity. (The ethnic categories were: non-Hispanic white; white Hispanic; black, including nonwhite Hispanic; and "other.") We then multiplied each of these values by the latest available (1994) US Census population estimates for the respective demographic group.[12] We then summed these products. We divided this summed value by the 1994 population count for each age category to obtain an adjusted 1996 rate of uninsured people in that category. We also divided the summed value by the 1994 population of the state of Florida to obtain an adjusted estimate for the state as a whole.[12]

Age distribution of Florida's uninsured. To estimate the age distribution of the uninsured population, we divided each age category's summed value, as described in the previous paragraph, by the summed values for all age groups. Before doing so, we subtracted the reported number of uninsured newborns in 1994 from the 0–19 age group to produce unduplicated estimates for newborns and the 0–19 age group excluding newborns.

RESULTS

Table 1 shows trends in uninsured hospitalizations in Florida for 1992–1996. The percentage of uninsured hospitalizations decreased each year, from a high of 8.7% in 1992 to a low of 7.9% in 1996. These decreases reflected an increase each year in total hospitalizations; the number of uninsured hospitalizations remained fairly constant from 1993 to 1996.

Frequently occurring conditions. Figure 1 shows the percentage of uninsured hospitalizations in 1996 for frequently occurring illnesses of children and adolescents, young adults, and older adults. We found greater percent-

Hospitalization indicator conditions have the advantage of being a state data source.

ages of uninsured patients among those hospitalized for life-threatening illnesses such as chest pain and HIV-related conditions than among those hospitalized for more discretionary procedures such as back surgery and hysterectomy. This suggests that specific non-discretionary illnesses may serve as a better indicator of the level of uninsurance in a community than all hospital stays combined.

Indicator conditions. Figure 2 shows the number of appendectomies performed in Florida hospitals in 1996 for people younger than age 40 years in five-year age groupings. The smallest number of cases was reported for ages 0–4 years. The number of cases peaked in the 10–14 age group. There were a sufficient number of cases in these younger age groups to allow us to measure the rate of uninsured appendectomies among children and young adults.

The uninsured percentages of hospitalizations for appendectomies and heart attacks for the 40–54 age category are shown in Table 2. The difference in the uninsured percentages was within 2.5 percentage points for each of the years examined.

Unadjusted and adjusted rates. Table 3 shows unadjusted and adjusted estimates of Florida's uninsured pop-

ulation in 1996 by age category. No adjustment was required for newborns because the data include the entire population of interest except newborns born at home, in birth centers, and military hospitals. (Based on vital records, AHCA estimates newborns in these categories at less than 2% of all births in Florida.[13])

The adjusted and unadjusted values shown in Table 3 are generally similar, with the largest difference occurring in the 20–29 age group. Males had a lower rate of insurance coverage than females in this age group and a higher rate of hospitalization for appendectomies.[11] The adjustment reduced the estimate of the uninsured to account for the under-representation of females.

These data show that that Floridians without health insurance in 1996 comprised an estimated 17.3% of the population, or 2.5 million people (95% confidence interval [CI] 16.0%, 18.6%). The highest percentage of uninsured people was among young adults in their 20s (33.9%), with the rate declining to less than 1% among the elderly. All adult age groups through age 54 had higher rates than children and adolescents. Among children and adolescents ages 0–19 years, excluding newborns, almost one in six were uninsured. One in five of the population younger than age 65 were uninsured.

Table 1. Hospitalizations in which patient was uninsured as a percentage of total hospitalizations, Florida, 1992–1996

| Year	Number of hospitalizations in which patient was uninsured	Total hospitalizations	Percentage in which patient was uninsured
1992	157,009	1,800,532	8.7
1993	153,911	1,827,958	8.4
1994	154,791	1,854,935	8.3
1995	154,417	1,899,580	8.1
1996	153,861	1,936,735	7.9

SOURCE: Reference 11

Figure 1. Hospitalizations for frequently occurring conditions, Florida, 1996: uninsured patients as percentage of all patients
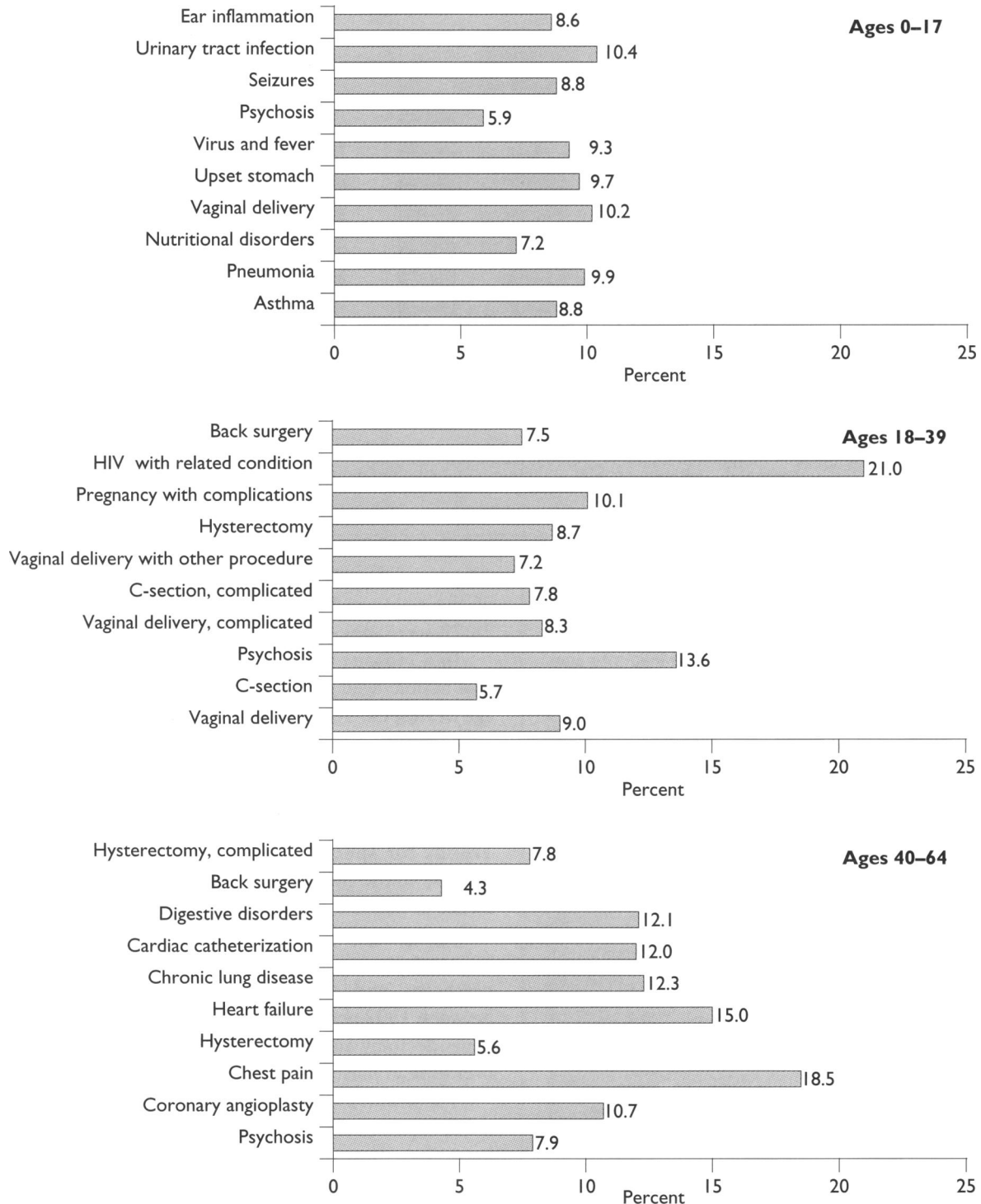
SOURCE: Reference 11

Figure 2. Number of appendectomies performed in Florida, 1996, by age group
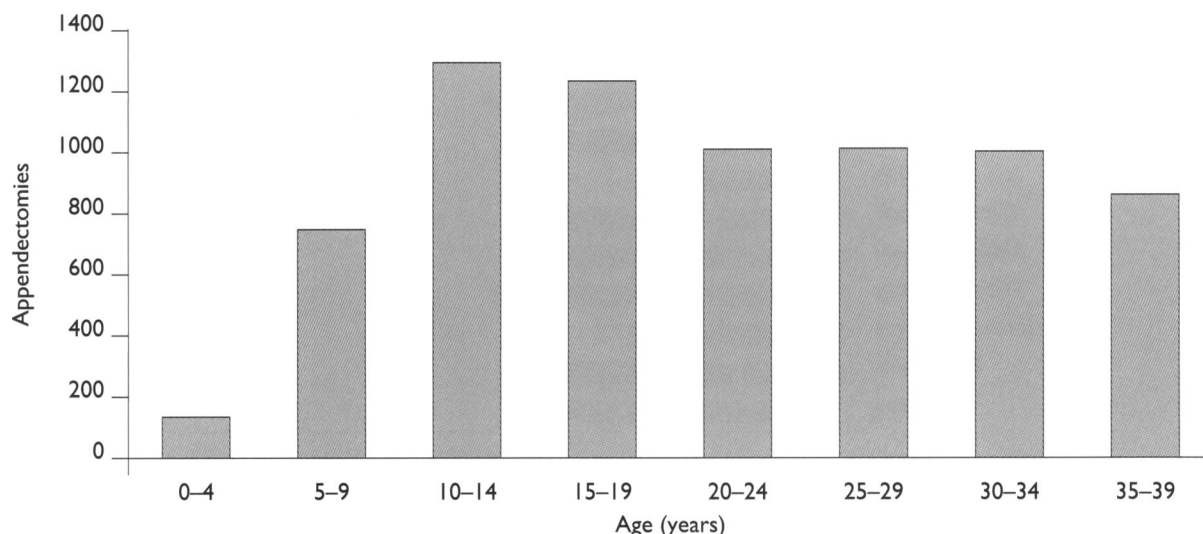
NOTES: Data reported by Florida hospitals to the Florida Agency for Health Care Administration. Appendectomies defined as those coded with Diagnosis Related Groups (DRG) codes 164–167, which do not include appendectomies incidental to other surgery. The 0–4 age range includes newborns.

Age distribution. The age distribution of the uninsured population, as shown in Table 4, reflects the high percentage of uninsured young adults. In 1996, 23.7% of uninsured people were children and adolescents ages

Table 2. Hospitalizations for appendectomies and heart attacks among patients ages 40–54, Florida, 1992–1996: uninsured patients as percentage of all patients

Year(s)	Appendectomy patients: percentage uninsured	Heart attack patients: percentage uninsured
1992.	19.4	21.9
1993.	20.6	20.4
1994.	19.6	20.2
1995.	18.5	19.9
1996.	18.5	19.9
1992–1996.	19.3	20.4

NOTES: Hospitalizations for appendectomies were those coded with Diagnosis Related Groups (DRGs) 164-167. Hospitalizations for heart attacks were those coded with ICD-9-CM principal diagnosis codes for acute myocardial infarction (410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, or 410.91).

ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification

SOURCE: Reference 11

19 years and younger, including newborns. Almost 50% of the uninsured were from 20 to 39 years old, and 28.7% were ages 40 to 64 years.

In a separate analysis of hospital charges, we found that middle-aged adults accounted for a greater percentage of hospital costs than their percentage of uninsured hospitalizations.[11] People ages 40–64 years accounted for 38% of all uninsured hospitalizations in 1996 and generated 50% of the hospital charges for the uninsured.[11]

Trends for specific demographic groups. It is also possible to use the three indicator conditions to monitor trends in insurance coverage for specific gender, ethnic, and age groups. In Florida, an analysis based on these indicator conditions revealed that insurance coverage of newborns and children and adolescents increased between 1992 and 1996.[11] Insurance coverage for adult appendectomy and heart attack patients did not change over time in most age groups.[11]

The health insurance coverage rates of minority ethnic groups increased from 1992 to 1996 but remained lower than those of white patients.[11]

Gender differences were also found. For example, among patients in their 20s, 42.6% of male appendectomy patients were uninsured in 1996, compared with 26% of female appendectomy patients.[11]

Table 3. Estimated percentage of population without health insurance, by age group, Florida, 1996

Indicator condition	Percentage without health insurance: unadjusted estimates	Percentage without health insurance: estimates adjusted for gender and ethnicity	
		Estimate	95% CI
Newborns	9.5	9.5	9.4, 9.6
Appendectomies			
0–19, including newborns..........	16.1	15.9	14.7, 17.1
20–29.........................	35.9	33.9	31.8, 36.0
30–39.........................	24.5	23.3	21.3, 25.3
Heart attacks			
40–54.........................	19.9	20.4	19.4, 21.4
55–64.........................	13.4	14.1	13.4, 14.8
65 and older	0.7	0.7	0.6, 0.8
State total......................	—	17.3	16.0, 18.6

NOTES: Indicator conditions were as follows: (a) newborns (Diagnosis Related Groups [DRGs] 385–391); (b) for ages 0–39, appendectomies (DRGs 164–167); (c) for ages 40 and older, heart attacks (ICD-9-CM principal diagnosis codes 410.01, 410.11, 410.21, 410.31, 410.41, 410.51, 410.61, 410.71, 410.81, 410.91). The 95% confidence intervals for the adjusted estimates are based on the standard errors of the percentages.

ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification

CI = confidence interval

SOURCE: Reference 11

DISCUSSION

Using specific indicator conditions, we estimated that 17.3% of Florida's population, or 2.5 million people, lacked health insurance coverage in 1996.[14]

To be useful indicator conditions, the incidence of appendicitis and heart attacks should not be related to insurance status. In a study of avoidable hospitalizations, Weissman et al. note, "Prevailing clinical wisdom is that hospitalization for appendicitis is almost certain and that the incidence of appendicitis is generally unrelated to the health and socioeconomic status of the population."[15]

One disadvantage of using appendectomies as an indicator is that patients experience only one appendectomy. Thus, the number of people with any chance of having an appendectomy decreases with increasing age, reducing the number of cases. This is evident in Figure 2, which shows the number of appendectomies performed in Florida hospitals for five-year age groups through age 64. While the smallest number of cases was reported for children ages 4 years and younger, the number of cases peaked in the 10–14 year age group.

There may be more reason to expect a relationship between insurance status and having a heart attack. Like appendicitis, heart attacks may occur unexpectedly

in people who feel healthy prior to the onset. However, heart attacks may occur after a period of warning symptoms or clinical indicators such as high cholesterol levels. Chronic conditions may encourage the purchase of health insurance. In addition, some people may have a family history of early heart attacks, an experience that may raise awareness of the need for health insurance. Conversely, the uninsured rate may be higher among some people who are at high risk for heart attacks such

Table 4. Estimated age distribution of the uninsured population, Florida, 1996

Age group	Percentage of uninsured population
Newborns......................	0.8
0–19, excluding newborns..........	22.9
20–29	25.3
30–39	21.6
40–54	21.3
55–64	7.4
65 and older	0.8
Total...........................	100.0

SOURCE: Reference 11

as those who are disabled mentally or physically. And the lack of insurance may be due to unemployment or other stressful conditions that may increase the risk of heart attacks.

Another desirable characteristic of an indicator condition, in addition to being unrelated to insurance status, is that the incidence of the condition does not vary by sex or by ethnic category. We found that hospital rates do vary (not shown), suggesting that incidence rates vary. Hospitalization rates for appendectomies and heart attacks in Florida were greater for males than females among all age groups, which may have resulted in overestimating the number of uninsured. Hospital rates for appendectomies and heart attacks were lower for African Americans than for whites, which may have resulted in underestimating the number of uninsured.

Comparison with CPS estimates. Since the techniques described here generate a point-in-time estimate and the CPS estimates represent lack of insurance coverage during an entire year, one would expect that the CPS estimate to be lower. However, the CPS 1996 estimate of 18.9% (95% confidence interval [CI]17.9, 19.9%) is 1.6 percentage points higher than the estimate we obtained using the indicator conditions.[1] As noted earlier, some analysts have suggested that the CPS yields a point-in-time estimate, and these results are consistent with that interpretation.

One reason why the estimates based on hospitalization data may be lower than the CPS estimates is that uninsured patients may be underrepresented among hospital patients treated for heart attacks and appendectomies. An uninsured person may not seek treatment for the chest pain of a "mild" heart attack, for example. Uninsured patients may avoid hospitalization and survive, or die before reaching the hospital.

A study reported by Braveman et al. found that uninsured appendectomy patients were more likely to have ruptured appendixes.[16] This suggests that uninsured patients with abdominal pain are more likely to delay treatment than insured patients with abdominal pain.

Hospitalization indicator conditions have the advantage of being a state data source. According to the National Association of Health Data Organizations, 28 state agencies currently have hospital databases containing payer and insurance information (Personal communication, Stacey Long, Manager Management Information Systems and Research, National Association of Health Data Organizations, August 1998). Information on gender and ethnicity is usually available. The methods of this analysis are replicable in other states without the requisite of additional data collection. Uninsured hospitalization data may be a useful data source for state-level analysis of the uninsured population.

References

1. Bennefield RL. Current population reports: health insurance coverage: 1997. Washington: Bureau of the Census (US); 1998.
2. Long SH, Marquis MS. Some pitfalls in making cost estimates of state health insurance coverage expansions. Inquiry 1996;33:85-91.
3. Bennefield RL. Current population reports: health insurance coverage: 1994. Washington: Bureau of the Census (US); 1995.
4. Swartz K. Dynamics of people without health insurance. JAMA 1994;271:64-6.
5. Schroeder SA. The medically uninsured—will they always be with us? N Engl J Med 1996;334:1130-3.
6. Bennefield RL. A comparative analysis of health insurance coverage estimates: data from CPS and SIPP. Presented at the American Statistical Association Joint Statistical Meetings; 1996 Aug 6; Chicago, IL.
7. McBride T. Uninsured spells of the poor: prevalence and duration. Health Care Financing Rev 1997;19:145-60.
8. Siddharthan K, Ahern M. Inpatient utilization by undocumented immigrants without insurance. J Health Care Poor Underserved 1996;7:355-63.
9. Loprest P, Uccello C. Uninsured older adults: implications for changing Medicare eligibility. New York: The Urban Institute; 1997.
10. Short PF, Banthin JS. New estimates of the underinsured younger than 65 years. JAMA 1995;274:1302-6.
11. State of Florida Agency for Health Care Administration. Uninsured hospitalizations in Florida: a study of persons without health insurance. Tallahassee: AHCA; 1998 Jul.
12. Bureau of the Census (US). Estimate of the population of counties by age, sex, and race: 1990–1994. Available from: URL: www.census.gov
13. Bureau of Economic and Business Research, University of Florida. Florida statistical abstract. 31st ed. Gainesville: University Press of Florida; 1997.
14. State of Florida Agency for Health Care Administration. Population estimates. Tallahassee: AHCA; 1997 Oct.
15. Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. JAMA 1992;268:2388-94.
16. Braveman P, Schaaf VM, Egerter S, Bennett T, Schecter W. Insurance-related differences in the risk of ruptured appendix. N Engl J Med 1994;331:444-9. ■