The Impact of BadgerCare on Hospital Uncompensated Care in Wisconsin:

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ABSTRACT

This paper examines the impact of reducing the number of uninsured individuals on uncompensated care costs to hospitals in Wisconsin through the expansion of the BadgerCare program, a state funded health insurance program for low-income working families with children. The importance of understanding the impact of this program and the role hospitals play in providing health care for which they are not reimbursed is important as health care costs continue to rise. This study uses annual hospital data from the Wisconsin Hospital Association (WHA) and census-based data to account for both hospital characteristics and county-based factors. Through the application of a multilevel modeling methodology, the study found that between the inception of BadgerCare in 1999 through 2004, the expansion of this program accounted for a 6-year cumulative savings of $283.08 million in hospital uncompensated care spending.

Keywords: uninsured; uncompensated care; BadgerCare
The number of non-elderly uninsured in the United States continues to rise. Between 1999 and 2004 the number of uninsured rose from 14.5 percent to 15.7 percent. In Wisconsin, the average level of uninsurance between 2000 and 2004 was 10.4 percent, higher than both Iowa (10.1 percent) and Minnesota (8.5 percent) (Current Population Report, August 2005).

Our current voluntary and predominantly employer-based system of insurance coverage for the non-elderly population has contributed to maintaining the national rate of uninsurance between 15 and 18 percent over the last 25 years (Miller, Vigdor and Manning 2004). With the rising costs of healthcare and the associated difficulty for many employers in maintaining affordable health insurance benefits, we’ve begun to see a steady increase in the rate of uninsurance both nationally and within Wisconsin.

The impact of uninsurance in the United States is far reaching. In most cases, this impact can be quantified and estimated in monetary terms. Economic costs are the value of resources devoted to one purpose that are not then available for alternative uses – the resources’ opportunity cost (Miller, et al 2004). For instance, the costs associated with worse health among those who lack coverage directly impact the resources available for other activities in the community. These costs affect individuals, families and firms directly, and also cost society indirectly by redirecting resources and slowing the economy.

A large portion of the societal safety net for the uninsured in the United States consists of uncompensated care provided by the nation’s hospitals and physicians. Uncompensated care is generally defined as the sum of charity care (care provided with no expectation of payment) and bad debt (care for which payment is expected but never received) (Blewett, Davidson, Brown and Maude-Griffin, 2003; Chen, Shambaugh-Miller, Zhang, Xu, Hesford, Skinner, Fraser-Maginn and Mueller, 2005). The cost of this care continues to rise. Total uncompensated care provided in 2001 was estimated to be $35 billion, including $23.6 billion in patients’ unpaid hospital bills (Hadley and Holahan, 2003). Wisconsin hospitals provided $578 million in uncompensated care in fiscal year 2004 (Wisconsin Hospital Association (WHA), 2006).

Most states have developed options to assist hospitals with the provision of uncompensated care. These options include providing public payments to hospitals providing uncompensated care via regulated rates or pools that cover such care, providing direct tax subsidies to these hospitals, or expanding public insurance coverage (Atkinson, Helms, and Needleman 1997; Blewett, et al. 2003).

NEW CONTRIBUTION

The association between increased access to health insurance and reduced levels of uncompensated care for hospitals seems intuitive, yet surprisingly few studies in the research literature address this relationship. This analysis focuses on the impact of offering a state-subsidized insurance program for low-income working families with children on the levels of
uncompensated care provided by hospitals in Wisconsin. The hypothesis being tested implies that as more people receive public health insurance coverage that includes inpatient hospital care, there should be a corresponding decrease in demand for uncompensated care. The reduction in uncompensated care should increase hospital revenue and decrease bad debt.

Expanding on the “Hospital Provision of Uncompensated Care and Public Program Enrollment” study conducted by Blewett et al. in 2003, where researchers used a multiple regression model to estimate the effect of increasing enrollment in MinnesotaCare1 on uncompensated care in Minnesota, our study incorporates a multi-level analysis to examine the between-group effects of public program enrollment on uncompensated care in Wisconsin. A major contribution of our study is multilevel modeling approach using repeated-observations with Hierarchical Linear Modeling (HLM) software (Raudenbush and Bryk 2002; Raudenbush et al. 2004; Singer and Wilbert 2003) to explore the effects of between county on the within-county mean annual change in uncompensated care expenditures and the impact of BadgerCare enrollment within each county to examine between-county expenditure differences. Our study uses longitudinal data reported by the Wisconsin Hospital Association (WHA) between 1999 and 2004 to examine the impact of increasing enrollment in BadgerCare on uncompensated care provided by Wisconsin hospitals.

In this article, we present background information on the current levels of uncompensated care provided by hospitals in Wisconsin and address the implementation and expansion of the BadgerCare program. We then outline our analysis through a discussion of our methodological approach, data sources, variable definitions and findings. Lastly, we briefly examine the policy implications of our findings, both in Wisconsin and nationally.

BACKGROUND

Uncompensated care is provided under two federal provisions, the Hospital Survey and Construction Act, or Hill-Burton Act of 1946, and the Emergency Medical Treatment and Active Labor Act (EMTALA) of 1986 (Blewett, et al. 2003; State of Washington, 2004). Under the Hill-Burton Act hospitals receiving federal capital funds are required to provided uncompensated care over a 20-year period in an amount equal to the lesser of 3 percent of the hospital’s annual operating costs or 10 percent of the federal assistance it received (Weissman 1996). In general, the EMTALA requires hospital emergency rooms to treat patients with emergency conditions and stabilize them prior to transferring, irrespective of ability to pay. Additionally, nonprofit and public hospitals must provide some community benefit and may include care for the poor as part of their public or nonprofit mission (Blewett, et al. 2003).

Hill-Burton obligations continue to decline over time, yet a number of hospitals still find themselves providing a large share of the healthcare safety net services for the poor and uninsured. Approximately 650 facilities had Hill-Burton obligations as of December 31, 2000 and 410 by June 2, 2003 (Conover and Zeitler 2004). Once a hospital meets its “fiscal obligation” under Hill-Burton, the federal government still requires that the hospital fulfill its

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1 A state-subsidized health insurance program for the working poor.
“community services obligation,” for which there is no time limit. In addition, all hospitals must also meet their EMTALA obligations under federal law, as well as any state mandates for providing charity care.

Private hospitals provide most uncompensated care. For instance, in 1994, private not-for-profit hospitals provided 55.8 percent of all hospital based uncompensated care and private for-profit hospitals contributed an additional 5.3 percent (Mann, Melnick, Bamezi and Zwanziger 1997). Public facilities provided the remaining 38.9 percent. However, public and major teaching hospitals carry a disproportionate share of the uncompensated care obligation. Uncompensated care accounts for 15.4 percent of total expenses in urban public hospitals and 18.9 percent of total expenses in major public teaching hospitals (Mann et al. 1997).

As evidenced by the statistics presented above, uncompensated care accounts for a substantial percentage of total hospital expense, particularly among urban public hospitals and major public teaching hospitals. However, the differentiation between bad debt and charity care for uncompensated care provided by these hospitals may not be accurate. Weissman et al. (1999) point out that 84 percent of designated charity care was given to patients with income below the federal poverty level (FPL), while 76 percent of bad debt for emergency care and 64 percent of bad debt for non-emergency care were for patients under the federal poverty level. In reality, those individuals with incomes close to the FPL would, in all likelihood, find it very difficult to absorb any in-patient hospital costs. Therefore, most bad debt is for patients who cannot reasonably be expected to pay for care and should be included as charity care rather than bad debt resulting from defaults by those able to pay (Mirvis 2000).

Weissman’s point is particularly germane to the study presented here. Accepting that most uncompensated care is provided to individuals who cannot afford to pay for their care, including many above the FPL, it is reasonable to assume that increasing enrollment in public health insurance programs for low-income individuals would directly impact the level of uncompensated care provided by hospitals.

Blewett et al. cite two studies that show the impact of increases in publicly subsidized health insurance on levels of uncompensated care. Dubay, Norton, and Moon (1995) found that Medicaid expansion for pregnant women and infants decreased hospital uncompensated care by 5 percent. They also found the impact of increased Medicaid eligibility on uncompensated care to be even greater among teaching hospitals, where a 13 percent increase in the eligible Medicaid population resulted in a 29 percent decrease in uncompensated care charges per admission (Dubay, Norton, and Moon 1995). Among non-teaching hospitals uncompensated care costs decreased 4 percent with a 13 percent increase in Medicaid eligibles.

BadgerCare provides health insurance to low-income working families with children up to 185 percent of the FPL. These families can remain on BadgerCare until their income exceeds 200 percent of the FPL. In short, BadgerCare serves individuals who may have previously received charity and bad debt uncompensated care provided by Wisconsin hospitals.
UNCOMPENSATED CARE IN WISCONSIN

All non-state and non-federal Wisconsin hospitals, including general medical-surgical (GMS), psychiatric, alcohol and other drug abuse (AODA), and rehabilitation hospitals, are required to publicly report annual uncompensated care information. Each hospital submits a Fiscal Year (FY) Uncompensated Health Care Plan and a Fiscal Year Hospital Fiscal Survey within 120 days following the end of the hospital’s fiscal year (Wisconsin Hospital Association, 2006).

In fiscal year 2004, 142 Wisconsin hospitals provided $578 million of uncompensated health care to their patients. Uncompensated health care in Wisconsin grew 92 percent from FY 1999 to FY 2004. Almost 41 percent of all uncompensated care in FY 2004 was classified as charity care. The remaining 59 percent was classified as bad debt. Wisconsin’s 142 hospitals provided uncompensated care to 884,126 patients, up 4.6 percent from the 143 hospitals in FY 2003 (Wisconsin Hospital Association, 2006).

<table>
<thead>
<tr>
<th>Table 1: Uncompensated Care in Wisconsin 1999-2004</th>
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<tbody>
<tr>
<td>FY Year</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>1999</td>
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<td>2000</td>
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<td>2002</td>
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<td>2003</td>
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<tr>
<td>2004</td>
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<tr>
<td><strong>Total</strong></td>
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Total uncompensated care grew 16 percent from FY 2003 ($496.2 million). Measured as a percentage of total gross patient revenue (charges), total uncompensated care rose slightly from 2.9 percent in FY 2003 to 3 percent in FY 2004, versus a national average of approximately 6 percent (Bellandi 1998). Charity care averaged 1.2 percent of gross patient revenue and bad debt averaged 1.8 percent. Measured as a percentage of total gross non-governmental patient revenue uncompensated care averaged 6.5 percent among all Wisconsin hospitals. Six Wisconsin hospitals still have Hill-Burton obligations related to grants they received between 1946 and 1974 (Wisconsin Hospital Association, 2006).

As with most other states, uncompensated care in Wisconsin is concentrated in urban areas. Hospitals in Milwaukee County provided 32 percent of all uncompensated health care ($183.2 million) statewide, including 34 percent of charity care and 30 percent of bad debt (Wisconsin Hospital Association, 2006). Milwaukee County accounts for approximately 17 percent of the
state population. However, sixty-one of the 142 hospitals in the state each delivered more than $2 million in uncompensated care.

BADGERCARE

Wisconsin’s BadgerCare Program is a health insurance program for low-income working families with children. BadgerCare provides health insurance coverage for families with incomes too high for Medicaid who are without alternative health insurance coverage. BadgerCare is designed to help families transition from public assistance to private insurance. Enrollment in BadgerCare began in 1999. BadgerCare is funded by federal funds, state general purpose revenue (GPR) and premium revenue. Wisconsin spent $61.2 million in GPR on BadgerCare in calendar year 2004.

To qualify for BadgerCare, families must not be eligible for Medicaid and must have family income at or below 185 percent of the FPL. Families can remain eligible for BadgerCare until their family income exceeds 200 percent of the FPL. No asset test is required for enrollment in BadgerCare. Families with private insurance or who have had private insurance in the past three months, or who have access to a group health insurance plan where their employer pays at least 80 percent of the monthly premium, are not eligible for BadgerCare.

Most BadgerCare families are enrolled in the Wisconsin Medicaid managed care Health Maintenance Organization (HMO) program. BadgerCare can also pay premiums to enroll families in their employer-sponsored health insurance plan. To qualify for this benefit, the Health Insurance Premium Purchase (HIPP) program, the employer must pay at least 40 percent, but less than 80 percent, of a family premium, and the cost of the family premium plus wraparound services equal to BadgerCare coverage must be cost-effective compared to BadgerCare HMO enrollment. As of December 2005, 679 families have been enrolled in HIPP (BadgerCare at a Glance, December 2005).

BadgerCare began in July 1999 with an initial enrollment of 8,647. As of December 2005, BadgerCare was providing health care coverage for over 91,000 people. Since the implementation of BadgerCare in 1999, almost 114,000 children have enrolled in Medicaid. In many cases, families on BadgerCare mix coverage, with younger children enrolling in Medicaid and older siblings and parents enrolling in BadgerCare. The integration of BadgerCare with Medicaid maximizes federal funding and eligibility to enroll as many working uninsured families as possible (BadgerCare at a Glance, December 2005).

BadgerCare serves as a public safety-net for low-income families with children. As noted above, many children were never enrolled in Medicaid prior to BadgerCare. Only 39 percent of BadgerCare enrollees as of December 2005 were in Medicaid at any point in the last four years. Of note, 60 percent of Milwaukee County’s BadgerCare caseload was formerly on Medicaid, while 32 percent of BadgerCare enrollees outside of Milwaukee were previously enrolled in Medicaid (BadgerCare at a Glance, December 2005). According to the State of Wisconsin
Department of Health and Family Services, the increased enrollment in BadgerCare and Medicaid provides coverage to virtually all low-income children in Wisconsin. (Ibid.)

DATA DEFINITIONS AND SOURCES

The data elements for this study attempt to mirror those of a similar study conducted in Minnesota and identify similarities and differences between two border states with similar population sizes, characteristics and demographics (Blewett et al., 2003).

Dependent Variable

For purposes of this study, the outcome variable of interest is uncompensated care per capita for each county in the analysis for years 1999 through 2004. These data were obtained from the WHA annual Hospital Fiscal Survey. The amounts of uncompensated care are comprised of the fiscal year bad debt expenses reported on the final audited financial statements and charity care, which is measured on the basis of revenue foregone, at full established rates. The bad debt expense for each hospital can be defined as the provision of actual uncollected expenses resulting from the extension of credit. Charity care is health services that never resulted in cash inflows. Charity care results from a provider’s policy to provide health care services free of charge or at reduced charges to individuals who meet certain financial criteria.

The uncompensated care charges were converted to costs by applying year and hospital specific cost-to-charge ratios (hospital’s total operating expenses/total charges). All costs and charge measures utilized in the analysis were adjusted to 2004 dollars by means of the Medical Care component of the Consumer Price Index (CPI). Specific county population counts and characteristics are based on data from the U.S. Bureau of the Census and Wisconsin Department of Administration (DOA) Census and Population Information.

Independent and Control Variables

Previous research has recognized several variables that might have some influence on levels of uncompensated care over time. More often than not, the burden of uncompensated care is being shouldered by large public hospitals serving lower-income, uninsured populations in urban areas (Weissman, 2005; Vladeck, 2006; Hayden 2005; Blewett et al., 2003). In order to address any biases of this nature, particularly in a state such as Wisconsin where the city of Milwaukee is vastly different from the rest of the state, and different from the other metropolitan communities throughout the state, our study controlled for attributes and hospital characteristics that might possibly be associated with uncompensated care. Additional control variables for a county’s characteristics, levels of managed care penetration, and market factors such as unemployment rates are included.

BadgerCare Enrollment: In this study, BadgerCare enrollment is measured as the proportion of the county population enrolled in the program for each of the six years covered in this analysis.
Since BadgerCare was implemented in July 1999, only six months of claims were included for that year versus full years of experience in the remaining years. BadgerCare enrollment data were obtained from the Wisconsin Department of Health and Family Services’ (DHFS) Medicaid Management Information System (MMIS).

Other Measures of Insurance Coverage: These variables include hospital charges per county capita for Medicare, managed care, and out-of-pocket hospital charges. The study also includes the percentage of the population enrolled in Medicaid and county general relief to isolate the effect of enrollment in other public programs.

Population Characteristics: Various county population characteristics that may impact levels of uncompensated care are controlled for in the analysis. Specifically, county level data from the DOA Census and Population Information are used to control for particular market forces. These variables include the percentage of the population below the poverty level, unemployment levels, percent of individuals aged 65 and older, per capita income, and the percentage of the population who are nonwhite.

Hospital Characteristics: To control for the impact of hospital ownership on levels of uncompensated care, variables for expenses per capita for government run, religious, non-government and not-for-profit run hospitals are also included. These data were obtained from the Wisconsin DHFS’ Annual Survey of Hospitals.

Quantity of Hospital Services: To control for the size and quantity of services within each hospital that may impact levels of uncompensated care, the number of licensed beds per thousand population and total hospital admissions per thousand population were also included in the model.

ANALYTIC METHOD

The Minnesota uncompensated care study utilizes a multivariate regression approach to estimate the effect of the MinnesotaCare program on hospital uncompensated care expenditures applying county level data for 1992 through 1996 (Blewett et al., 2003). In this study, we applied a multilevel model using HLM (hierarchical linear modeling) version 6.2 software\(^2\). Traditional regression analyses with the use of dummy variables and hierarchical ANOVA, as was done in the Minnesota study, work well in a fixed-effects model if the number of subjects in each nested group is equal (Raudenbush & Bryk, 2002). However, because random factors may exist at more than one level of the data hierarchy (between counties or hospitals), HLM affords greater flexibility, statistical power, and provides a more appropriate analysis. An additional advantage of HLM is its flexibility in accommodating unbalanced designs (i.e., the number and spacing of time points vary annually for each hospital within each county), which was particularly relevant for the data in this analysis.

\(^2\) Because HLM software was used to construct the multilevel model used in this analysis, we generally refer to our multilevel approach as HLM.
While the Minnesota study was forced to eliminate those counties that did not contain consistent data for each of the five annual intervals during the study, our study was able to include those counties that did not have complete data during each of the six years of study due to hospital openings, closures or mergers. The HLM approach uses all available data. Essentially, each hospital and county that had data reported for at least one year can be included in the analysis. The assumption is that the data are missing at random, that is, the missingness depends only on the observed components of the complete data and not on the components that are missing (Little and Rubin 2002).

We conducted a HLM based on maximum likelihood estimation, using the software developed by Raudenbush, Bryk, Cheong, and Congdon (2004). This software enables researchers to more easily parse the variance that occurs within and between hospitals and within and between county characteristics. Some of the variation at each of the levels is due to randomness or error. Additionally, this model examines both fixed and random effects, meaning that the intercept and slope is allowed to vary for selected variables. The repeated measures of uncompensated care expenses per capita were conceived as being nested within hospitals; thus the analysis of change had three levels: repeated observations within hospitals (Level 1), between hospitals (Level 2) and between counties (Level 3).

The three level HLM equations applied to these data can be written as the following:

**Level 1 Model**:  
\[ Y_{ijk} = \pi_{0jk} + \pi_{1jk}a_{1jk} + \pi_{2jk}a_{2jk} + \ldots + \pi_{pjka_{pj}} + e_{ijk} \]

where

\[ \pi_{pj} = (p=0,1,\ldots,P) \] are the level-1 coefficients (the repeated uncompensated care per capita cost for each county)
\[ a_{pj} = \] is a level-1 predictor p for case i in level-2 unit j and level-3 unit k,
\[ e_{ijk} = \] is the level-1 random effect, and
\[ \sigma^2 = \] is the variance of \( e_{ijk} \), that is the level-1 variance.

**Level 2 Model**: Each of the \( \pi_{pj} \) coefficients in the level-1 model becomes an outcome variable in the level-2 model:

\[ \pi_{pkj} = \beta_{p0k} + \beta_{p1k}X_{1jk} + \beta_{p2k}X_{2jk} + \ldots + \beta_{PQpk}X_{Qpkj} + r_{pkj} \]

where

\[ \beta_{pqk} = (q=0,1,\ldots,Q) \] are level-2 coefficients (hospital level variables),
\[ X_{qjk} = \] is a level-2 predictor, and
\[ r_{pkj} = \]
rpjk is a level-2 random effect.

**Level 3 Model:** Each of the level-2 coefficients, β_{pqk}, defined in the level-2 model becomes an outcome variable in the level-3 model:

\[
\beta_{pqk} = \gamma_{pq0} + \gamma_{pq1}W_{1k} + \gamma_{pq2}W_{2k} + \ldots + \gamma_{pq{Spq}}W_{Spqk} + \mu_{pqk}
\]

\[
= \gamma_{pq0} + \sum_{s=1}^{Spq} \gamma_{pq{s}}W_{sk} + \mu_{pqk},
\]

where

\(\gamma_{pq{s}} (s=0,1,\ldots,Spq)\) are level-3 coefficients (county level variables),

\(W_{sk}\) is a level-3 predictor, and

\(\mu_{pqk}\) is a level-3 random effect.

The traditional approach has been to use a repeated measures ANOVA to assess group change over time. Repeated measures ANOVA focuses on the main or fixed effects of time and treats individual differences as error variance. Moreover, individuals or circumstances must be measured at the fixed time intervals with no missing data. Repeated measures ANOVAs also require an assumption of equal variance and covariance of the measurements at different points in time. Structural equation modeling can also be used to estimate multilevel growth models. Although this method is able to evaluate complex covariance structures, each individual must have the same number and spacing of measurements, and larger sample sizes are mandatory. Our smaller sample size led us to select HLM.
TABLE 2: Descriptive Statistics for Uncompensated Care Multilevel Variables

<table>
<thead>
<tr>
<th>Level 1: Within Hospitals</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999 Uncompensated Care $ per capita</td>
<td>255.00</td>
<td>45.94</td>
</tr>
<tr>
<td>2000 Uncompensated Care $ per capita</td>
<td>202.14</td>
<td>35.42</td>
</tr>
<tr>
<td>2001 Uncompensated Care $ per capita</td>
<td>155.68</td>
<td>51.94</td>
</tr>
<tr>
<td>2002 Uncompensated Care $ per capita</td>
<td>128.43</td>
<td>31.65</td>
</tr>
<tr>
<td>2003 Uncompensated Care $ per capita</td>
<td>68.39</td>
<td>30.27</td>
</tr>
<tr>
<td>2004 Uncompensated Care $ per capita</td>
<td>32.47</td>
<td>14.99</td>
</tr>
<tr>
<td>Overall Uncompensated Care $ per capita</td>
<td>139.29</td>
<td>73.84</td>
</tr>
</tbody>
</table>

Level 2: Between Hospitals

**Measures insurance coverage**

- Medicare charges per capita: 359.33, 260.24
- Managed care charges per capita: 183.07, 116.90
- Out-of-pocket hospital charges per capita: 35.91, 24.14

**Hospital characteristics**

- Government hospital expenses per capita: 182.90, 112.91
- Church-run hospital expenses per capita: 695.42, 601.40

**Quantity of hospital services**

- Licensed hospital beds per thousand population: 9.62, 7.08
- Total hospital admissions per thousand population: 39.56, 31.15
- Total operating expenses per capita: 495.59, 362.98

Level 3: Between Counties

**Population characteristics**

- Per capita income (thousands of dollars): 21.52, 3.33
- Poverty rate (%): 8.86, 3.59
- Nonwhite (% of population): 9.89, 10.42
- Unemployment rate (%): 4.93, 1.58
- Elderly (% of population): 13.89, 2.58
- BadgerCare enrollment (% of population): 2.90, 0.89
- Medicaid and General Assistance Medical Care enrollment (% of population): 14.03, 5.78

Note: N=852 county-year observations, weighted by county population. Charge and expenditures have been adjusted to 2004 dollars using the medical care component of the Consumer Price Index (CPI). Per capita income was also adjusted to 2004 terms using the CPI for all urban consumers.

RESULTS

Table 2 provides detailed descriptive statistics pertaining to the county-level means across the six years of observations, with each measure weighted by the respective county population. In this study, there were 144 hospitals in 65 of Wisconsin’s 72 counties between 1999 and 2004. The variables of interest represent county means weighted by county population. Descriptive statistics reveal that in Wisconsin during this timeframe average per capita income was $21,520; 9.9 percent of the population was nonwhite; and the unemployment rate was 4.93 percent.
BadgerCare enrollment represented 2.9 percent of the population, while those individuals with state public program participation accounted for 14 percent. During the time frame of our study, uncompensated care expenses were $139.29 per county resident.

Table 3 details the results of the three level, HLM model. As anticipated and similar to that of the Minnesota findings, the coefficient for BadgerCare enrollment was negative and significant \(p<.05\) after controlling for hospital characteristics, insurance status, and additional market based control variables. In interpreting the findings, a 1 percent increase in BadgerCare enrollment results in $3.67 decrease in uncompensated care expenditures per capita. This finding suggests that BadgerCare enrollment had a significant effect in reducing uncompensated care costs in Wisconsin. As BadgerCare enrollment grew between 1999 and 2004, uncompensated care levels declined.

Table 3: Parameter Estimates from Multilevel Model of County-Level Uncompensated Care Expenditures per Capita

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Estimated Coefficient</th>
<th>Standard Error</th>
<th>t Ratio</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BadgerCare Enrollment (% of population)</td>
<td>-3.663</td>
<td>1.563</td>
<td>-2.34</td>
<td>0.021</td>
</tr>
<tr>
<td>Medicaid and General Assistance Medical Care enrollment (% of population)</td>
<td>-0.677</td>
<td>0.412</td>
<td>-1.64</td>
<td>0.103</td>
</tr>
<tr>
<td>Medicare charges per capita</td>
<td>-0.046</td>
<td>0.020</td>
<td>-2.28</td>
<td>0.024</td>
</tr>
<tr>
<td>Managed care charges per capita</td>
<td>-0.189</td>
<td>0.076</td>
<td>-2.49</td>
<td>0.014</td>
</tr>
<tr>
<td>Out-of-Pocket charges per capita</td>
<td>0.034</td>
<td>0.059</td>
<td>0.57</td>
<td>0.569</td>
</tr>
<tr>
<td>Per capita income (thousands of dollars)</td>
<td>-0.374</td>
<td>0.283</td>
<td>-1.32</td>
<td>0.188</td>
</tr>
<tr>
<td>Poverty (% of population below poverty line)</td>
<td>-0.531</td>
<td>0.381</td>
<td>-1.39</td>
<td>0.166</td>
</tr>
<tr>
<td>Nonwhite (% of population)</td>
<td>0.288</td>
<td>0.159</td>
<td>1.81</td>
<td>0.073</td>
</tr>
<tr>
<td>Elderly (% of population)</td>
<td>1.138</td>
<td>0.604</td>
<td>1.89</td>
<td>0.062</td>
</tr>
<tr>
<td>Unemployment Rate (%)</td>
<td>-0.160</td>
<td>0.070</td>
<td>-2.31</td>
<td>0.023</td>
</tr>
<tr>
<td>Government hospital expenditures per capita</td>
<td>-0.028</td>
<td>0.016</td>
<td>-1.74</td>
<td>0.085</td>
</tr>
<tr>
<td>Church-run hospital expenditures per capita</td>
<td>0.046</td>
<td>0.025</td>
<td>1.81</td>
<td>0.072</td>
</tr>
<tr>
<td>Licensed hospital beds per thousand population</td>
<td>-1.412</td>
<td>0.255</td>
<td>-5.53</td>
<td>0.000</td>
</tr>
<tr>
<td>Hospital admissions per thousand population</td>
<td>-0.158</td>
<td>0.823</td>
<td>-0.19</td>
<td>0.848</td>
</tr>
<tr>
<td>Total operating expenses per capita</td>
<td>0.156</td>
<td>0.040</td>
<td>3.87</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Deviance (no. of estimated parameters) | 1218 (15)
Likelihood ratio test \(\chi^2(14)\) | 112 | 0.00

Notes: Unstandardized coefficients are presented. BadgerCare enrollment, per capita income, poverty rate, nonwhite rate, and elderly rate were centered around the mean. Uncompensated care per capita for each county in the analysis is the outcome variable.

Additional variables that were significantly associated with lower expenditures of uncompensated care included Medicare charges per capita \(p<.05\), managed care charges per capita \(p<.05\), the unemployment rate \(p<.05\), and licensed hospital beds per thousand population \(p<.000\).

As was the case in the Minnesota study, our study yielded a significant association between higher uncompensated care expenditures and total operating expenses per capita by county \(p<.000\). However, the coefficient for this variable was nearly three times greater in our study than in the Minnesota study (0.156 versus 0.054). Through the use of the multilevel HLM model, we are able to ascertain some insight into differences occurring between hospitals and counties. Because the explained variation between hospitals and counties was relatively strong at twenty-eight and thirty-one percent, respectively, this would lead us to conclude that the
impact of uncompensated care had a much greater impact on operating expenses in Wisconsin, and is likely tied to geographic distribution.

In our analysis, the licensed hospital beds per thousand population at the county level were significantly and negatively associated with uncompensated care. This is the opposite direction that was observed in Minnesota, although this covariate was not significant in that study. This finding is potentially addressing phenomena that might also be attributable to geographic variation between the counties. Although there might be more hospital beds available in particular communities, it is not necessarily indicative of having larger levels of uncompensated care. As previously noted, prior research has shown that the burden of uncompensated care is often greatest among large public hospitals serving lower-income, uninsured populations in urban areas (Weissman, 2005; Vladeck, 2006; Hayden 2005; Blewett et al., 2003). This finding may potentially indicate that larger hospitals in rural areas serving multiple communities are not experiencing the levels of uncompensated that are seen in urban areas. Although our study did not yield a significant finding for the percentage of the county populations that were elderly, individuals who were elderly and living in rural communities may have had their health insurance needs met through the provision of Medicare, which was significant and negatively related to uncompensated care.

Our study yielded a significant additional finding of particular note that differed from the Minnesota study, but fell in accordance with prior research. This was the managed care volume represented by the managed care charges per capita and levels of uncompensated care (Mann et al., 1997). Other control variables in our study where we were able to control for county characteristics and hospital revenue by payer source and size that were not significant, but were so in the Minnesota study, included hospital out-of-pocket charges per capita, church-run hospital expenditures per capita, and the percentage of the population below poverty. In the Minnesota study, both the hospital out-of-pocket charges per capita and church-run hospitals were consistent with the concept that out-of-pocket charges go unpaid and are recorded as bad debt over time and that counties with many uninsured people have greater use of these free hospital services. The Minnesota study also found that the population below poverty is significantly and negatively associated with uncompensated care per capita.

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual Expenditures on Uncompensated Care</th>
<th>Estimated Expenditures without BadgerCare</th>
<th>Estimated Savings from BadgerCare</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>341.29</td>
<td>362.83</td>
<td>21.54</td>
</tr>
<tr>
<td>2000</td>
<td>388.33</td>
<td>435.50</td>
<td>47.17</td>
</tr>
<tr>
<td>2001</td>
<td>408.75</td>
<td>459.98</td>
<td>51.23</td>
</tr>
<tr>
<td>2002</td>
<td>472.51</td>
<td>528.16</td>
<td>55.65</td>
</tr>
<tr>
<td>2003</td>
<td>509.21</td>
<td>566.70</td>
<td>57.49</td>
</tr>
<tr>
<td>2004</td>
<td>578.00</td>
<td>628.00</td>
<td>50.00</td>
</tr>
<tr>
<td>6-year total</td>
<td>2698.09</td>
<td>2981.17</td>
<td>283.08</td>
</tr>
</tbody>
</table>

Actual and estimated dollar figures have been adjusted to 2004 dollars using the medical care component of the Consumer Price Index (CPI).
Limitations

While hospital costs represent one of the largest categories of health care spending, and hospitals are the most expensive setting in terms of spending per unit of service, this study does not address other areas of health care spending, such as physicians, where opportunities for savings may be observed. Information about uncompensated care in Wisconsin, is readily available where all hospitals make available both the cost of this care and the related billing policies.

The assumptions that are necessary for linear regression analyses also apply to analyses using HLM, and they can be just as complex. One assumption of linear equations is that the errors—because of measurement noise and omitted variables—are distributed normally and are independent of the variables in the equation. In addition, any assumption that the relationships are linear is often overlooked in regression analyses and HLM.

One assumption that relates only to HLM is also important. The major criterion for HLM analyses is to have appropriate data. This means that the data must be hierarchical, with groups nested within higher-level groups, and with enough cases within and between groups to provide sufficient degrees of freedom for the linear equations. As well, the data must be especially accurate and the variables especially reliable and valid because small inaccuracies at one level can lead to bias in relationships found at the next level.

Finally, like other linear models, level-2 and level-3 models in HLM are sensitive to large standard errors of the estimates, to omitted variables, and to the transformations of existing variables. All of these factors mentioned display the potential dangers of using this new sophisticated methodology on poor concepts, poor data, or both. Burstein, Kim and Delandshere (1989) remind researchers that the new, more powerful methods can produce very complex, yet very wrong, results if data assumptions are not carefully considered.

DISCUSSION

The Wisconsin Department of Health and Family Services has two primary strategies to gain a better understanding of the demographic and economic characteristics of the uninsured in Wisconsin and analyze options to extend coverage to this population. First, the State is working to maximize the effectiveness of the State’s current program models through Medicaid and the BadgerCare program as well as the private employer purchasing pool. Second, to identify effective use of resources to target and expand access for the remaining uninsured.

Wisconsin’s annual Family Health Survey over the last several years has clearly been demonstrating that the uninsured in Wisconsin are most likely to be low income working adults or children in families with working parents. Many of these families reside throughout the state in rural as well as urban areas. They are also disproportionately African American or Hispanics. Tackling the uninsured problem requires an understanding of the nature of these population groups.
What does this relationship mean for policy makers and others concerned with health care access issues? During the 1999-2004 time period of increases in BadgerCare enrollment, this analysis suggests reductions in uncompensated care spending – or hospital cost savings – of $283.08 million less on uncompensated care than without BadgerCare (Table 4). The magnitude of these savings for Wisconsin hospitals is noteworthy, and implies that a percentage of actual spending on hospital services for BadgerCare enrollees during this period would have been realized as uncompensated care costs by the state’s hospitals in the absence of the program.

Beyond Wisconsin’s borders, our results suggest that health policy and budget analysts evaluating the costs and benefits of state-level eligibility expansions and programs – either prospectively or retrospectively – should consider potential benefits of reduced uncompensated care burdens for hospitals and other providers.

Finally, implications for further research from this study lend support for the necessity to better understand reasons for the use of uncompensated health care for both geographic and economic factors. Given the varying differences among counties and regions throughout Wisconsin, more detailed investigation into economic and geographic factors may reveal useful insights into the possible reasons for hospital utilization by uninsured patients.
REFERENCES


