Medicaid Disenrollment Costs: Maricopa County, AZ

Richard J. Butler, PhD
Martha Jane Knowlton Coray Professor
Department of Economics
Brigham Young University

William G. Johnson, PhD
Professor of Economics
School of Health Management and Policy
Arizona State University

Mary E. Rimsza, MD, FAAP, FSAM
Research Professor
School of Health Management and Policy
Arizona State University

April 2006

Prepared for the Risk Theory Society Meetings, 2006

Rough Draft: comments and suggestions are very welcomed. Please. Pretty please. The sausage is not yet completely stuffed…

Introduction

Insurance, including the provision of many non-wage benefits for workers, uses many mechanisms for limiting moral hazard and adverse selection problems. At times, these incentives work at cross purposes: for example, cost sharing meant to limit moral hazard might also worsen adverse selection to the extent that cost sharing limits full participation of the employees in a program. We are concerned with an analogous situation with respect to public health insurance in the U.S.—Medicaid (also know as SCHIP and AHCCCS in Arizona)—do cost sharing mechanisms in Medicaid, such as increased premiums and copays, that limit participation, change the expected social costs of health care? That is, how does Medicaid disenrollment shift health care costs?

This paper has two parts. In the first part, we explore the cost-shifting implications of Medicaid disenrollment using 2004 data for Maricopa County, Arizona. This is the best data set assembled to address this issue: it includes all Medicaid transactions, transactions from every hospital and community health center in the county in 2004, and a good deal else. Essentially, the only transactions excluded in the Maricopa County data are ambulatory care visits by the uninsured at private doctors' offices (though again, we do have data from all the community health centers, and we have all the transactions for the Medicaid population, whether received in a private doctors office or not). For reasons discussed below, we think that this exclusion will not substantially bias our results. We partition our analysis by race and age, finding the results robust with respect to these partitions: disenrollment from Medicaid tends to increase the cost of health care provided by shifting care from the less expensive doctor's offices to more expensive emergency rooms of hospitals. We estimate health care costs rise by one percent for a disenrollment of about 10 percent.

In the second part of the paper, we more explicitly treat individual unobserved heterogeneity (which we, in the usual bold faced manner, "integrated out" in our specifications in Part 1) and sample selection by creating a Maricopa panel data set for 2002 through 2004, and estimating maximum likelihood models of joint selection, heterogeneity, and program participation.

Part I

Measures to control the growth in expenditures by Medicaid and State Children's Health Insurance Programs (SCHIP) have become a common feature of state government policy. A recent survey of state Medicaid program directors revealed that every state implemented at least one new Medicaid cost containment measure in fiscal year 2005 (Smith, et al., 2005). The most prevalent measures involved freezing provider payment rates or taking actions to control prescription drug costs. Other measures used to control costs include new or higher co-payments and premium increases.

Arizona Health Care Cost Containment System (AHCCCS) is basically all insurance coverage funded through Medicaid and SCHIP programs in the state of Arizona. Reducing the number of persons enrolled in AHCCCS or reducing the programs' share of expenditures by increasing premiums will, all else equal, reduce AHCCCS expenditures. The reductions in these expenditures do not, however, represent an equal reduction in expenditures for the health care of the affected persons from the viewpoint of state or federal governments, or society as a whole. The net effect of increased premiums or more restrictive eligibility for AHCCCS can only be understood by considering all of the immediate and subsequent effects of the changes. The evaluation should not be limited to the effects on the AHCCCS program but should include impacts measured from a social perspective (Gold, Russell, Siegal, & Weinstein, 1996)

Persons who disenroll from AHCCCS in response to increased cost sharing (e.g., increased premiums or co-pays) or who are disenrolled by changes in eligibility criteria are not likely to replace public program insurance with private commercial insurance. The empirical evidence to support this contention is limited in scope but there is little reason to suppose that persons living near the poverty level will be able to afford the premiums associated with private commercial health insurance.

Persons without health insurance coverage are more likely than insured persons to use emergency departments (ED) and safety net providers, such as community health centers, for primary care. Absent insurance coverage, most of their health care costs are paid by federal and state governments through Medicare and Medicaid in the form of disproportionate share hospital adjustments and indirect medical education payments in addition to other federal programs, such as community health centers and the Maternal and Child Health Bureau. Federal and state funds have been estimated to cover 85% of the total costs of uncompensated care (Hadley & Holahan, 2003).[1] The potential savings from cutbacks in SCHIP programs would also be offset by increased Medicaid medically-needy spending, increased tax subsidies to

[1] See Hadley and Holahan (2003) for a discussion of the sources of funding for uncompensated care.

private insurance, and increased costs associated with uncompensated care (Selden & Hudson, 2005). This report examines the uncompensated care component of disenrollment by estimating the impact of a 10% decrease in AHCCCS enrollment in Arizona. The assumed value of 10% represents a lower bound on the likely impact of most changes proposed by state governments. Most of the changes in premiums or eligibility observed in other states have produced much larger reductions in enrollments even for very small increases in costs to persons insured by Medicaid. In addition, we examined the total effect of disenrollment of the people enrolled in AHCCCS through the Health Insurance Flexibility and Accountability (HIFA) waiver program which expanded the SCHIP program to parents of SCHIP enrolled children in Arizona and other adults.

The outcomes of changes by Washington's Basic Health Plan, Minnesota's Minnesota Care, and Hawaii's Quest program include reductions in enrollment that range from 18% to 57% for increases in premiums ranging from 1% to 5% of family income (Ku & Coughlin, 2000). Texas recently experienced a 29% reduction in SCHIP enrollment in less than one year after increasing premiums, adding a 90-day waiting period for benefits, and reducing the enrollment period from twelve months to six months (Dunkelberg & O'Malley, 2004). In this study we examined the effects of disenrollment, regardless of the cause.

Data

To estimate the changes in community health care utilization we analyzed data in *Arizona HealthQuery* (*AZHQ*) which includes health care transactions on over five million Arizona residents, including all AHCCCS participants. *AZHQ* links patients and claims across health care systems over multiple years. With few exceptions, visits by non-AHCCCS insured patients to physician offices are not included in *AZHQ*. Thus, visits by uninsured persons to physician offices are not included in these estimates. It is true, however, that the *AZHQ* database includes most of the safety net providers (i.e., St. Vincent de Paul Clinic, Clinica Adelante, and Mountain Park Health Center) which are the most likely sites for ambulatory, non-ED care for uninsured persons.

We partitioned the place of service into three categories of type of treatments received: emergency department (ED) visits, inpatient hospitalizations (IP), and physician or ambulatory care visits (AC). Health care transactions for uninsured people and for AHCCCS-insured people living in Maricopa County in 2004 were analyzed. As indicated in the two left hand columns of Table 1, our database included complete observations on 184,387 uninsured people who received health care from an *AZHQ* data partner in 2004, and 302,071 AHCCCS-insured persons.

The sample means for insured and uninsured persons, respectively, are described in Tables 1 and 2. Some racial/ethnic groups have distinctively higher levels of insured status in our sample: Blacks are one and a half times as likely to be on AHCCCS as they are to be uninsured (in the two left hand columns of Tables 1 and 2, compare .092 with .057). American Indians are four to five times more likely to be insured (compare .05 to .01 in Table 1, .04 to .01 in Table 2). Hispanic children are more likely to be insured than other ethnic groups but Hispanic adults are less likely to be insured. Children are much more likely to be insured overall. Males are generally less likely to be insured than females, though Hispanic males are as likely to be insured as they are to be uninsured.

Table 1: Means of Explanatory Variables for the Logistic Regression

	All Persons		*Children (0-17)*		*Adults (18-up)*		*Hispanic*		*White*	
	Insured	*Uninsured*	*Insured*	*Uninsured*	*Insured*	*Uninsured*	*Insured*	*Uninsured*	*Insured*	*Uninsured*
Male	0.3861	0.4374	0.4991	0.5032	0.2432	0.4172	0.4039	0.4108	0.3670	0.4562
White	0.3290	0.4089	0.2354	0.2989	0.4473	0.4426	-	-	1.0000	1.0000
Black	0.0916	0.0566	0.0803	0.0495	0.1059	0.0588	-	-	-	-
Hispanic	0.5082	0.4645	0.6203	0.5568	0.3664	0.4362	1.0000	1.0000	-	-
American Indian	0.0506	0.0119	0.0472	0.0124	0.0550	0.0117	-	-	-	-
Ambulatory Sensitive Condition	0.3451	0.2069	0.4886	0.3572	0.1635	0.1607	0.3961	0.2512	0.2739	0.1615
Age 0-5	0.2940	0.1161	0.5263	0.4945	-	-	0.3881	0.1374	0.1866	0.0843
Age 5-10	0.1287	0.0437	0.2304	0.1860	-	-	0.1530	0.0537	0.0962	0.0311
Age 10-15	0.0889	0.0408	0.1592	0.1739	-	-	0.0943	0.0487	0.0745	0.0306
Age 15-20	0.0781	0.0777	0.0838	0.1454	0.0710	0.0569	0.0757	0.0892	0.0752	0.0644
Age 20-25	0.0808	0.1370	-	-	0.1831	0.1791	0.0677	0.1449	0.0971	0.1283
Age 25-30	0.0661	0.1200	-	-	0.1497	0.1569	0.0545	0.1374	0.0807	0.1034
Age 30-35	0.0527	0.1027	-	-	0.1194	0.1343	0.0392	0.1110	0.0682	0.0957
Age 35-40	0.0456	0.0818	-	-	0.1033	0.1069	0.0328	0.0779	0.0615	0.0863
Age 40-45	0.0417	0.0718	-	-	0.0944	0.0938	0.0263	0.0593	0.0607	0.0861
Age 45-50	0.0310	0.0567	-	-	0.0702	0.0741	0.0182	0.0426	0.0475	0.0714
Age 50-55	0.0229	0.0430	-	-	0.0520	0.0562	0.0129	0.0311	0.0352	0.0559
Age 55-60	0.0166	0.0333	-	-	0.0376	0.0435	0.0099	0.0229	0.0262	0.0451
Age 60-65	0.0145	0.0267	-	-	0.0328	0.0349	0.0082	0.0172	0.0236	0.0390
Age 65-70	0.0093	0.0150	-	-	0.0211	0.0196	0.0056	0.0102	0.0136	0.0211
Age 70-75	0.0076	0.0120	-	-	0.0173	0.0157	0.0044	0.0067	0.0115	0.0189
Age 75-80	0.0071	0.0095	-	-	0.0161	0.0124	0.0037	0.0044	0.0119	0.0166
Age 80-85	0.0061	0.0066	-	-	0.0138	0.0087	0.0024	0.0032	0.0120	0.0113
Age 85-90	0.0042	0.0032	-	-	0.0095	0.0042	0.0011	0.0006	0.0091	0.0066
Pediatrician	0.1958	0.0679	0.3457	0.2276	0.0061	0.0189	0.2616	0.1064	0.1268	0.0299
Internal/Family Med Positions	0.1849	0.2054	0.1427	0.2044	0.2382	0.2057	0.1607	0.2701	0.2247	0.1463
OB GYN	0.0623	0.0636	0.0086	0.0157	0.1303	0.0783	0.0628	0.0971	0.0677	0.0355
Sample size	302,071	184,387	168,722	43,313	133,349	141,074	153,538	85,658	99,385	75,401

Table 2: Means of Explanatory Variables for the Counts Regression Model (Negative Binomial Regression)

	All Persons		*Children (0-17)*		*Adults (18-up)*		*Hispanic*		*White*	
	Insured	*Uninsured*	*Insured*	*Uninsured*	*Insured*	*Uninsured*	*Insured*	*Uninsured*	*Insured*	*Uninsured*
Male	0.4033	0.4478	0.4989	0.5036	0.2570	0.4297	0.4203	0.4220	0.3836	0.4654
White	0.3221	0.4010	0.2361	0.2988	0.4538	0.4342	-	-	1.0000	1.0000
Black	0.0911	0.0553	0.0804	0.0492	0.1075	0.0573	-	-	-	-
Hispanic	0.5235	0.4715	0.6246	0.5543	0.3687	0.4446	1.0000	1.0000	-	-
American Indian	0.0423	0.0104	0.0419	0.0118	0.0429	0.0100	-	-	-	-
Ambulatory Sensitive Condition	0.3739	0.2064	0.5004	0.3531	0.1803	0.1587	0.4251	0.2472	0.3001	0.1625
Age 0-5	0.3198	0.1214	0.5287	0.4958	-	-	0.4123	0.1410	0.2074	0.0896
Age 5-10	0.1399	0.0456	0.2313	0.1865	-	-	0.1626	0.0547	0.1072	0.0336
Age 10-15	0.0959	0.0424	0.1586	0.1733	-	-	0.0997	0.0497	0.0824	0.0324
Age 15-20	0.0773	0.0795	0.0812	0.1442	0.0715	0.0585	0.0728	0.0902	0.0763	0.0668
Age 20-25	0.0687	0.1374	-	-	0.1739	0.1819	0.0563	0.1448	0.0850	0.1290
Age 25-30	0.0581	0.1209	-	-	0.1471	0.1602	0.0475	0.1383	0.0725	0.1041
Age 30-35	0.0476	0.1027	-	-	0.1206	0.1361	0.0350	0.1110	0.0631	0.0958
Age 35-40	0.0417	0.0813	-	-	0.1057	0.1077	0.0297	0.0772	0.0581	0.0864
Age 40-45	0.0376	0.0705	-	-	0.0953	0.0933	0.0239	0.0586	0.0562	0.0850
Age 45-50	0.0271	0.0554	-	-	0.0687	0.0734	0.0156	0.0418	0.0431	0.0706
Age 50-55	0.0197	0.0410	-	-	0.0499	0.0544	0.0109	0.0294	0.0313	0.0538
Age 55-60	0.0141	0.0316	-	-	0.0358	0.0419	0.0082	0.0219	0.0231	0.0430
Age 60-65	0.0123	0.0251	-	-	0.0313	0.0333	0.0067	0.0161	0.0211	0.0371
Age 65-70	0.0093	0.0139	-	-	0.0236	0.0184	0.0053	0.0095	0.0144	0.0198
Age 70-75	0.0078	0.0110	-	-	0.0198	0.0146	0.0044	0.0063	0.0125	0.0176
Age 75-80	0.0074	0.0087	-	-	0.0187	0.0115	0.0037	0.0041	0.0130	0.0154
Age 80-85	0.0064	0.0061	-	-	0.0163	0.0081	0.0025	0.0030	0.0133	0.0106
Age 85-90	0.0044	0.0029	-	-	0.0113	0.0039	0.0012	0.0006	0.0101	0.0060
Pediatrician	0.2168	0.0702	0.3546	0.2284	0.0058	0.0189	0.2810	0.1087	0.1436	0.0307
Internal/Family Med Positions	0.1938	0.1961	0.1492	0.1940	0.2621	0.1968	0.1672	0.2611	0.2339	0.1326
OB GYN	0.0438	0.0581	0.0069	0.0146	0.1003	0.0722	0.0448	0.0897	0.0459	0.0303
Sample size	269,924	167,156	163,273	40,945	106,651	126,211	141,323	78,822	86,969	67,041

Methods

Statistical Analysis

For those with a health care encounter in Maricopa County in 2004, a system of three logistic regression equations is used to determine whether that encounter occurs as an emergency department (ED) visit, inpatient visits (IP), or physician visits (AC) (that is, an ambulatory care visit outside an ED). Additionally, a system of three nonlinear regression equations is used to estimate the quantity of services for each of the three types of health care services.

The logistic equations determining the type of visit can be specified as

Equation (1) $$\Pr(visit\ ED_i) = F(X_i\beta_{ED})$$

$$\Pr(visit\ IP_i) = F(X_i\beta_{IP})$$

$$\Pr(visit\ AC_i) = F(X_i\beta_{AC})$$

where $\Pr(visit\ ED_i)$ the first term on the left hand side, for example, is the likelihood that the health care encounter for the ith person was a visit to the emergency department, with $\Pr(visit\ IP_i)$ and $\Pr(visit\ AC_i)$ similarly defined as the likelihood that the encounter occurred as an inpatient visit or as an ambulatory care visit, respectively.

The right hand side of each term in Equation (1), for example, $F(X_i\beta_{ED})$, indicates that the probability that health care encounter was in the emergency room depends on a nonlinear function of the ith individual's demographic/claim characteristics, X_i, multiplied by a vector of regression determined coefficients, β_{ED}. Included in the individual's characteristics (X_i) are race/ethnicity (White, non-Hispanic; Hispanic; Black; Asian; American Indian; Other), gender, detailed age groups, indicators for whether the attending physician is a pediatrician, in internal medicine or family practice, or has an obstetrics/gynecology specialty, and an indicator for an ambulatory care sensitive (ACS) condition.[2]

An ACS condition is a condition that could be treated in a primary care setting if timely care was provided, but if left untreated, may result in one or more hospitalizations that could have been

[2] bacterial pneumonia; asthma; congenital heart failure; hypertension; angina; cellulitis; diabetes; hypoglycemia; gastroenteritis; kidney/urinary tract infection; dehydration; iron-deficiency anemia; nutritional deficiencies; failure to thrive; pelvic inflammatory disease; and dental conditions (Falik, Needleman, Wells, & Korb, 2001).

avoided with timely primary care. Examples of these conditions include asthma, gastroenteritis and kidney/urinary tract infections (Falik et al 2001). Children with an ACS condition are twice as likely to have an ED visit (Rimsza et al 2004) and have substantially larger hospital charges as children without an ACS condition (Shi et al 1999).

The estimating equations for the number of visits of each type that the individual received throughout the year can be specified as

Equation (2) $\textit{number of ED visits}_i = G(X_i\gamma_{ED})$

$\textit{number of IP visits}_i = G(X_i\gamma_{IP})$

$\textit{number of AC visits}_i = G(X_i\gamma_{AC})$

Just like the system of equations in (1), the right hand side indicates that the number of respective visits in 2004 depend upon a nonlinear function of the ith individual's characteristics, X_i, multiplied by a vector of regression determined coefficients, γ_{ED}. We used the estimated coefficients, and the associated demographic/visitation characteristics, in our disenrollment simulations below.

Each system of six equations is estimated for

All AHCCCS-insured people and uninsured people

AHCCCS-insured children and uninsured children separately

AHCCCS- insured and uninsured adults separately

Hispanic insured and uninsured persons separately

White, non-Hispanic insured and uninsured persons separately

Parents of SCHIP enrolled children (Medicaid Section 1115 waiver)

We estimate, therefore, a total of seventy two equations (six equations for each of these two comparisons groups for all six of the categories listed above).

The objective of this analysis is to predict changes in health care utilization for people insured by AHCCCS who are disenrolled. Differences in utilization for uninsured and AHCCCS-insured people are influenced by differences in demographic characteristics (e.g., because one group of people are older, the group is more or less likely to use the ED) and by differences in insurance coverage (e.g., because uninsured pay 100% of a physician's fees for routine services, they are more likely to delay routine care). We use the Oaxaca decomposition, modified to fit health care comparisons, to separate differences in utilization between AHCCCS-insured and uninsured people into differences due to the characteristics of the people and differences due to insurance.[3]

The final step of this analysis simulates the effect of changing the AHCCCS program to reduce enrollment by 10%. This disenrollment could be induced by a change in eligibility, a change in the co-payments associated with AHCCCS services, or simply a change in the monthly premiums for AHCCCS. For example, based on responses to increases in cost sharing in other states, we conservatively estimate that it would only take a $10 monthly premium to induce 10% of the SCHIP-insured population to drop coverage, adding them to the ranks of the uninsured (Ku & Coughlin, 2000; Madden, et al., 1995).

A person who loses AHCCCS coverage could theoretically enroll in private insurance. It is unlikely, however, that a family whose income is low enough to qualify for AHCCCS programs would be able to afford a private commercial insurance plan. A study from the Kaiser Family Foundation found that the annual premium for employer-sponsored health insurance in 2005 was $10,880.00 for family coverage and $4,024 for individual coverage and only 60% of employers offer health insurance benefits (Claxton, et al., 2005).

Findings from recent studies of Medicaid disenrollment in other states support the assumption that persons who disenroll from Medicaid become uninsured. Results from focus groups of adult Medicaid respondents in Oregon showed those who lost coverage due to premium increases became uninsured. Respondents with incomes up to 170% of the federal poverty level (FPL) stated that they could not afford private health insurance coverage without premium assistance from the state Medicaid program (LeCouteur, Perry, Artiga, & Rousseau, 2004). Based on data from the Community Population Survey, 54% of children who disenrolled from Medicaid between 1998 and 2001 became uninsured, despite being eligible for coverage (Sommers,

[3] The Oaxaca decomposition is a mathematical technique first used to measure discrimination (Oaxaca ,1973; Cotton, 1988; Johnson, Baldwin, & Burton, 1996; Baldwin, Butler, & Johnson, 2001; Baldwin & Johnson, 1994 and 1995). The Oaxaca decomposition separates the difference in the dependent variable between two groups into the difference due to observable characteristics (i.e., the portion of the difference explained by differences in the mean characteristics included in the model) and unobserved factors (i.e., the portion of the difference due to differences in the coefficients between the two groups. The difference due to unobserved factors is the measure of the effect of insurance in the current application.

2005). While the cost of care incurred during spells without insurance may help a family qualify for Medicaid in the future, Medicaid coverage is typically not retroactive in the state of Arizona, and thus the family's ability to reenroll due to high medical debt as a result of hospitalizations or other health care bills does not reduce the cost of their hospitalization. Therefore, we assume that people who disenroll from AHCCCS remain uninsured for the year.

The health care services that are considered here include the utilization of Emergency Departments (ED), Inpatient hospitalizations (IP) and the use of ambulatory care (AC). The impact of proposed changes is simulated by assuming that the 10% disenrolled from AHCCCS would become uninsured and exhibit medical usage patterns just like the currently uninsured. In particular, we combine the estimated coefficients of a multivariate model of health care utilization by currently uninsured people with people who are currently enrolled in AHCCCS, and assume 10% of this latter group becomes uninsured. A system of logistic regression equations is used to estimate the probability of emergency department (ED) visits, inpatient hospitalizations and ambulatory office visits, and a system of three nonlinear regression equations is used to estimate the quantity of services for each of the three services if 10% of the AHCCCS recipients become uninsured.

The net changes in utilization for AHCCCS-insured and uninsured people were calculated by multiplying the quantities of services by the numbers of people in each group before and after the simulated 10% disenrollment. The product was the net effect on the number of people using services and quantities of services. Total health care expenditures are based on the actual 2004 payments by AHCCCS for physician services, inpatient hospitalizations, and ED.

The average amount paid by uninsured for each service (e.g., ambulatory visit, inpatient hospitalization, ED visit) is multiplied times the quantity of each service before and after the simulated disenrollment to estimate the aggregate change in health care expenditures. The mean payment for visits in 2004 was $795.57 for ED visits, $586.55 for inpatient hospital visits and $162.64 for Ambulatory office visits.

We use the Oaxaca decomposition, modified to fit health care comparisons, to separate differences in utilization between AHCCCS-insured people and uninsured people into differences due to the characteristics of the people and differences due to insurance (Oaxaca, 1973; Johnson, Baldwin, & Burton, 1996; Means & Rubin, 2004). This decomposition separates observed differences in outcomes (probabilities of use or quantities of use) into differences associate with a person's demographic variables (the Xi in Equations (1) and (2) above) and differences due to the insurance coverage (the β in the logistic probability models, and the γ in the quantity regression models). For example, if we let n represent the number of individuals in the sample, then the average difference in the likelihood of using ED services between the insured (S) and the uninsured (U) is (recalling the right hand side of the first row in Equation (1):

Equation 3) $$Prob(ED\ Uninsured\ (U)) - Prob(ED\ Insured\ (S)) = \frac{\sum_{i=1}^{n} F(X_i^U \beta_{ED}^U)}{n} - \frac{\sum_{i=1}^{n} F(X_i^S \beta_{ED}^S)}{n}$$

Since we want to know what would happen when we applied the uninsured responses (β_{ED}^U) to the characteristics of the insured (X_i^S), we can simulate the change by computing $\frac{\sum_{i=1}^{n} F(X_i^S \beta_{ED}^U)}{n}$, which is just what would happen if the insured became uninsured and responded just like the uninsured currently do. The Oaxaca decomposition of the difference in Equation 3, for those using ED services, equals the following (by adding and subtracting the same middle term, $\frac{\sum_{i=1}^{n} F(X_i^S \beta_{ED}^U)}{n}$, we don't change the equality) :

Equation (4) $$= \left[\frac{\sum_{i=1}^{n} F(X_i^U \beta_{ED}^U)}{n} - \frac{\sum_{i=1}^{n} F(X_i^S \beta_{ED}^U)}{n}\right] + \left[\frac{\sum_{i=1}^{n} F(X_i^S \beta_{ED}^U)}{n} - \frac{\sum_{i=1}^{n} F(X_i^S \beta_{ED}^S)}{n}\right]$$

where the right hand side bracketed term is the difference in average probabilities for the insured, when we only change their insurance status (as the coefficients go from β_{ED}^S to β_{ED}^U and the X are held constant), and left hand side bracketed term is the difference in average probabilities when we leave insurance status the same and only change the characteristics of the groups (as the characteristics go from X_i^S to X_i^U as the β are held constant).

To see how these calculations work with our specific samples, refer to Table 3 in the Results section. The uninsured are approximately twice as likely to use ED services as those insured by AHCCCS (compare 0.465 to 0.226). Most of the difference in ED usage is due to the effect of insurance coverage (18.2 percentage points of the 23.9% difference is due to insurance, or about 18.2/23.9 = 76% of the differential is insurance related), rather than differences in demographic characteristics (only 5.7/23.9 = 24% is due to demographic differences). We next examine these differentials on the basis of our logistic probability regressions before examining our simulated cost differences using the quantity regressions.

Results

Probability of Using Services—Overall Utilizations (Table 3), by Age (Tables 4 and 5), and by Ethnicity (Tables 6 and 7)

There are two major results that stand out from the probability analyses that follow; results are also consistent across age and ethnic breakdowns:

> Most of the observed usage differences between the insured and uninsured (generally about three-fourths) is not due to their demographic characteristics, but to the effect of their insurance coverage (more than 70% of the differential use of ED services is, for example, explained by insurance coverage except for Whites, for which 59% of the differential is explained by insurance coverage).
>
> The most pronounced difference in usage is that the uninsured use the ED much more often and use ambulatory care much less often than the insured (in Table 3 for example, the uninsured use the ED for 46.5% of their health care encounters in our data compared to only 22.6% for the insured, while the uninsured only use ambulatory care services 33.2% of the encounters compared to 50.5% for the insured).

These two findings are robust with respect to age and ethnic partitions, suggesting that insurance status has a profound impact on the patterns of care observed between those insured and uninsured. In particular, those who are uninsured tend to use the emergency department for care rather than the less expensive visits to physician offices and ambulatory care centers. This is evident in Tables 3 through 8 for the respective demographic group as follows.

Table 3: Probability of Using At Least One Service, AHCCCS-Insured and Uninsured Individuals

Group	*N*	*Proportion*		
		ED	*Inpatient*	*Ambulatory Visit*
Section I: Probability of using at least one service				
1. **Uninsured**	**184,387**	**0.465**	**0.203**	**0.332**
2. **AHCCCS**	**302,071**	**0.226**	**0.269**	**0.505**
3. AHCCCS as if uninsured	302,071	0.408	0.198	0.390
4. Uninsured as if AHCCCS	184,387	0.274	0.304	0.423
Section II: Decomposing the difference in the probability of use between AHCCCS-insured -.214 and uninsured individuals				
Difference in probabilities (P_U - P_S) *= row 1 – row 2*		.239	-.066	-.173

		ED	Inpatient	Ambulatory
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		0.182 76.2%	-0.071 107.6%	-0.115 66.5%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		0.057 23.8%	0.005 -7.6%	-0.058 33.5%

Example: The proportion of persons using ED services is .465 for the uninsured and .226 for persons with AHCCCS coverage. Approximately 76.2% of the difference between the uninsured and the AHCCCS-insured is attributable to insurance or lack of it (.182/.239 = 76.2%). Less than 25% of the difference between uninsured and AHCCCS-insured persons in the proportion using the ED is attributable to differences in the average characteristics of persons in the two groups (.057/.239 = 23.8%).

Example: The proportion of persons using inpatient care is lower for the uninsured than for the AHCCCS-insured. If the AHCCCS-insured become uninsured, their personal characteristics imply that they would be even less likely than the current uninsured persons to use inpatient care. The logic of these examples applies throughout the empirical results.

Table 4: Adult Probability of Using At Least One Service, AHCCCS-Insured and Uninsured Individuals

		Percentage		
Group	*N*	*ED*	*Inpatient*	*Ambulatory*
Section I: Probability of using at least one service				
1. **Uninsured**	**141,074**	**0.476**	**0.210**	**0.314**
2. **AHCCCS**	**133,349**	**0.256**	**0.333**	**0.411**
3. AHCCCS as if uninsured	133,349	0.413	0.329	0.346
4. Uninsured as if AHCCCS	141,074	0.290	0.235	0.382
Section II: Decomposing the difference in the probability of use between AHCCCS-insured -.214 and uninsured individuals				
Difference in probabilities (P_U - P_S) *= row 1 – row 2*		.220	-.123	-.097
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		.157 71.4%	-.004 3.3%	-.065 67.0%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		.063 28.6%	-.119 96.7%	-.032 33.0%

Table 5: Child Probability of Using At Least One Service, AHCCCS-Insured and Uninsured Individuals

		Percentage		
Group	*N*	*ED*	*Inpatient*	*Ambulatory*
Section I: Probability of using at least one service				
1. **Uninsured**	**43,314**	**0.430**	**0.177**	**0.390**
2. **AHCCCS**	**168,723**	**0.203**	**0.214**	**0.580**
3. AHCCCS as if uninsured	168,723	0.412	0.174	0.413
4. Uninsured as if AHCCCS	43,314	0.233	0.333	0.545
Section II: Decomposing the difference in the probability of use between AHCCCS-insured -.214 and uninsured individuals				
Difference in probabilities (P_U - P_S) *= row 1 – row 2*		.227	-.037	-.190
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		.209 92.0%	-.040 108.1%	-.167 87.9%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		.018 8.0%	.003 -8.1%	-.023 12.1%

Table 6: Hispanic Probability of Using At Least One Service, AHCCCS-Insured and Uninsured Individuals

		Percentage		
Group	*N*	*ED*	*Inpatient*	*Ambulatory*
Section I: Probability of using at least one service				
1. **Uninsured**	**85,659**	**0.387**	**0.161**	**0.451**
2. **AHCCCS**	**153,539**	**0.220**	**0.250**	**0.530**
3. AHCCCS as if uninsured	153,539	0.401	0.157	0.442
4. Uninsured as if AHCCCS	85,659	0.245	0.280	0.477
Section II: Decomposing the difference in the probability of use between AHCCCS-insured -.214 and uninsured individuals				
Difference in probabilities (P_U - P_S) *= row 1 – row 2*		.167	-.089	-.079
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		*.181* *108.4%*	*-.093* *104.5%*	*-.088* *111.4%*
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		*-.014* *-8.4%*	*.004* *-4.5%*	*.009* *-11.4%*

Table 7: White Probability of Using At Least One Service, AHCCCS-Insured and Uninsured Individuals

		Percentage		
Group	*N*	*ED*	*Inpatient*	*Ambulatory*
Section I: Service Quantities				
1. **Uninsured**	**75,401**	**0.529**	**0.248**	**0.223**
2. **AHCCCS**	**99,385**	**0.246**	**0.263**	**0.491**
3. AHCCCS as if uninsured	99,385	0.412	0.272	0.313
4. Uninsured as if AHCCCS	75,401	0.307	0.320	0.374
Section II: Decomposing the difference in the quantities of services between AHCCCS-insured and uninsured individuals				
Difference in probabilities (P_U - P_S) *= row 1 – row 2*		.283	-.015	-.268
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		.166 58.7%	.009 -60.0%	-.178 66.4%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		.117 41.3%	-.024 160.0%	-.09 33.6%

Services Used and Their Cost Impact: Overall (Tables 8 and 9), by Age (Tables 10 through 13), and by Ethnicity (Tables 14 through 17)

In the last section, we presented estimates of the models given in Equation (1), the likelihood of having a health care encounter in the ED, relative to an encounter in inpatient services (IP) (i.e., hospital care), and relative to an encounter in ambulatory care (AC) (i.e., physician office visits). Though the examination of the frequency of claims across services reveals higher likelihoods of ED encounters and lower likelihoods of ambulatory care encounters for the uninsured, it does not provide enough information to quantify the relative importance of this shift from outpatient to ED care for the uninsured. From Tables 3 through 7, we know—for our sample of individuals receiving care—the likelihood that a particular service was *ever used* in 2004, but we do not know how much it was used.

To get an estimate of how many services were used, we turn to our estimates from Equation (2), where instead of estimating probability responses by the logistic regression function $F(X_i\beta)$, we estimate the quantity response by the negative binominal count regression function $G(X_i\gamma)$. With this change in notation, the Oaxaca decomposition logic is exactly the same as given above for Equations (3) and (4). Now, instead of Equation (3) we have, using ED services between the insured and uninsured as an example:

Equation (5) $$Q(ED\ Uninsured\ (U)) - Q(ED\ Insured\ (S)) = \frac{\sum_{i=1}^{n} G(X_i^U \gamma_{ED}^U)}{n} - \frac{\sum_{i=1}^{n} G(X_i^S \gamma_{ED}^S)}{n}$$

where $Q(.)$ indicates the quantity of health service encounters of the respective type. Since we want to know what would happen when we applied the uninsured responses (γ_{ED}^U) to the characteristics of the insured (X_i^S), we can again simulate the change by computing , $\frac{\sum_{i=1}^{n} G(X_i^S \gamma_{ED}^U)}{n}$ which is just what would happen if the insured became uninsured and responded just like the uninsured currently do. The Oaxaca decomposition of the difference in equation (5), for ED health care encounters, equals the following (by adding and subtracting the same middle term, $\frac{\sum_{i=1}^{n} G(X_i^S \gamma_{ED}^U)}{n}$, we don't change the equality) :

Equation (6) = $$\left[\frac{\sum_{i=1}^{n} G(X_i^U \gamma_{ED}^U)}{n} - \frac{\sum_{i=1}^{n} G(X_i^S \gamma_{ED}^U)}{n}\right] + \left[\frac{\sum_{i=1}^{n} G(X_i^S \gamma_{ED}^U)}{n} - \frac{\sum_{i=1}^{n} G(X_i^S \gamma_{ED}^S)}{n}\right]$$

where the right hand side bracketed term is the difference in average number of encounters for the insured, when we only change their insurance status (as the coefficients go from γ_{ED}^S to γ_{ED}^U and the X are held constant), and left hand side bracketed term is the difference in average number of encounters when we leave insurance status unchanged, only changing the characteristics of the groups (as the characteristics go from X_i^S to X_i^U as the γ are held constant).

To see how these calculations work with our specific samples, refer to the results presented in Table 8 below. They indicate that, in 2004, for every one hundred uninsured individuals, there are 77 ED encounters, while for every one hundred insured individuals, there are only 37 ED encounters. If the insured—those with AHCCCS—acted the same way as the uninsured sample did with respect to ED encounters, the insured number of encounters in ED settings would rise from 37 per hundred to 62 per hundred (as indicated in the left hand column of Table 8, lines 2 and 3). So, for every hundred individuals, there are 40 more ED encounters for the uninsured than for the insured (line 5). Of these 40 additional encounters in ED, 25 are explained by differences in insurance status only (line 6), or 62.9% (=.253/.402) of the difference is due to insurance.

The general findings from these encounter regressions are that:

Except for Whites (where insurance coverage and demographic differences are equally important), most of the differences in usage between the insured and uninsured is due to the effect of the insurance coverage rather than differences in their characteristics;

No matter how we partition the decomposition, the uninsured have more emergency department encounters and more inpatient days, and less ambulatory care encounters, than do the insured—so that the lack of insurance shifts health care away from ambulatory care and towards the more expensive ED encounters and inpatient days; and

Our simulations (Tables 9, 11, 13, 15, and 17) indicate that this shift increases costs roughly by $4 million in our various partitions of the data, or about 1% (0.8 % in Table 9; 0.8% in Table 11—adults; 1.2% in Table 13—children; 0.6% in Table 15—Hispanics; and 1.4% in Table 17— Whites).

Table 8: Service Utilization, AHCCCS-Insured and Uninsured Individuals

		Number of Services		
Group	*N*	*ED Visits*	*Inpatient Hospital Visits*	*Ambulatory Visits*
Section I: Service Quantities				
1. **Uninsured**	**167,156**	**0.771**	**1.163**	**0.988**
2. **AHCCCS**	**269,924**	**0.369**	**0.688**	**2.094**
3. AHCCCS as if uninsured	269,924	0.622	0.898	1.068
4. Uninsured as if AHCCCS	167,156	0.489	0.998	2.109
Section II: Decomposing the difference in the quantities of services between AHCCCS-insured and uninsured individuals				
Utilization Differences (Q_U - Q_S) *= row 1 – row 2*		.402	.475	-1.106
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		.253 62.9%	.210 44.2%	-1.026 92.8%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		.149 37.1%	.265 55.8%	-.080 7.2%

Figure 1: Mean Number of Service Utilization

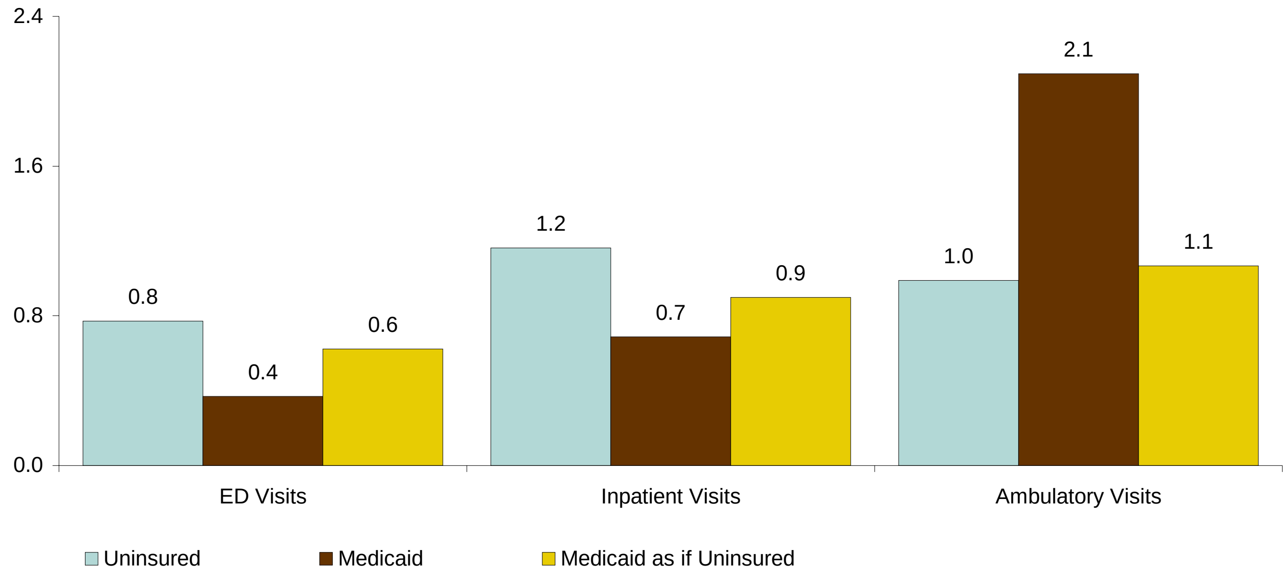
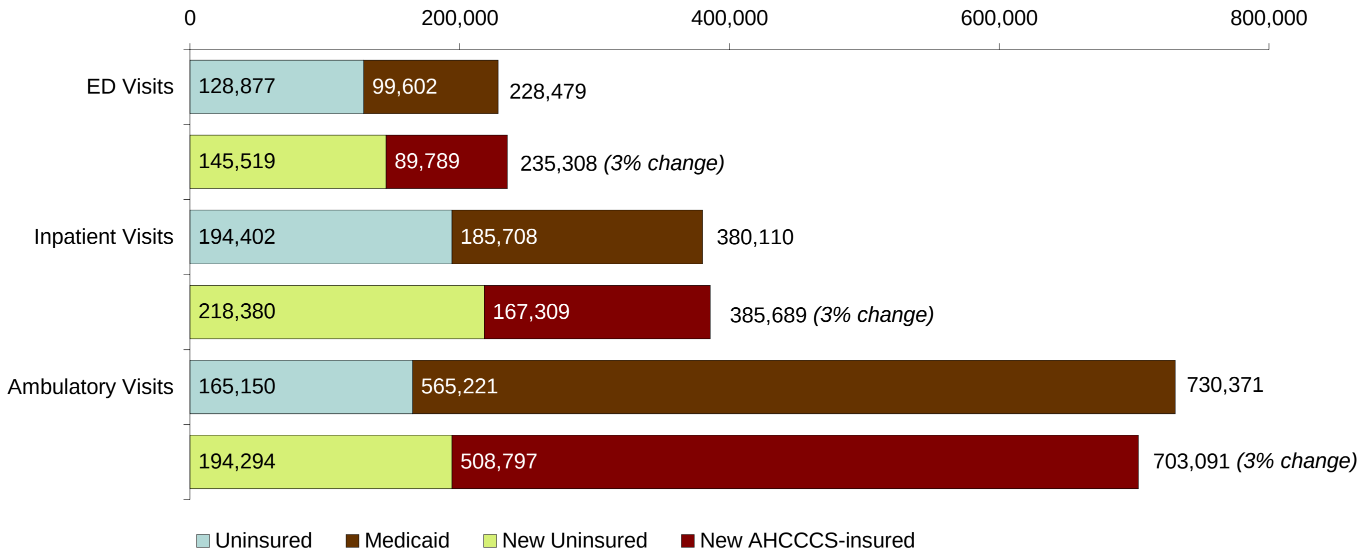


Table 9 applies the results in Table 8 to indicate what the effect of disenrollment of 10% of the currently AHCCCS-enrolled population in Maricopa County (all ages, ethnic groups, and both genders) for those with complete data for the analysis indicated in Equations (2), (5), and (6). As discussed in the beginning of this section, Table 8 indicates that the uninsured have 40 more ED encounters per 100 individuals than do the insured; the uninsured experience 48 more inpatient days per hundred individuals than the insured, and the uninsured have 111 fewer ambulatory office visits per hundred individuals than the insured.

Table 9: Total Effect of an AHCCCS Premium Change, Service Utilization

	Number of Services			
	N	*ED Visits*	*Inpatient Hospital Visits*	*Physician Visits*
Uninsured individuals	**167,156**	**128,877**	**194,402**	**165,150**
AHCCCS-insured individuals	**269,924**	**99,602**	**185,708**	**565,221**
Total visits = Uninsured + AHCCCS insured	*437,080*	*228,479*	*380,110*	*730,371*
New uninsured (10% AHCCCS enrollees to uninsured)	194,148	145,519	218,380	194,294
New AHCCCS-insured	242,932	89,789	167,309	508,797
Total visits = New Uninsured + New AHCCCS insured		*235,308*	*385,689*	*703,091*
Net change in utilization		6,829	5,579	-27,280
Net change in expenditures		**$5,432,948**	**$3,272,362**	**-$4,436,819**

Figure 2: Change in Service Utilization



In 2004, the uninsured had 128,877 ED visits (computed from Table 8, row one as number of individuals in the sample, 167,156, multiplied by the number of encounters per individual, .771, with the other values in rows 1 and 2 calculated similarly), compared to 99,602 for the insured. The uninsured had 194,402 inpatient hospital days compared to 185,708 for the AHCCCS-insured. Ambulatory office visits, however, were much higher among the AHCCCS-insureds, with 565,211 visits compared to 165,150 for the uninsured.

To determine the total effect of disenrollment on health care costs, we used the mean payments for care for uninsured persons for each type of visit from AZHQ data and multiplied the cost of the visit by the change in number of visits if 10% of the currently enrolled AHCCCS patients were disenrolled and became uninsured. The mean payment for visits in 2004 was $795.57 for ED visits, $586.55 for inpatient hospital visits and $162.64 for ambulatory office visits. Because of the increased utilization of ED and increased utilization of inpatient care by the uninsured, the net change in ED expenditures if 10% of AHCCCS-enrolled people living in Maricopa County become uninsured is $5,432,948 for ED visits and $3,272,362 for inpatient visits. This increase is somewhat offset by the decrease in ambulatory office visits by the uninsured, which would result in a net decrease in expenditures of $4,436,819 (Table 9, row 8) so that net expenditures increase by $4,268,491, or 0.8% of the total costs of all encounters in this table.

Table 10: Adult Service Utilization, AHCCCS-Insured and Uninsured Individuals

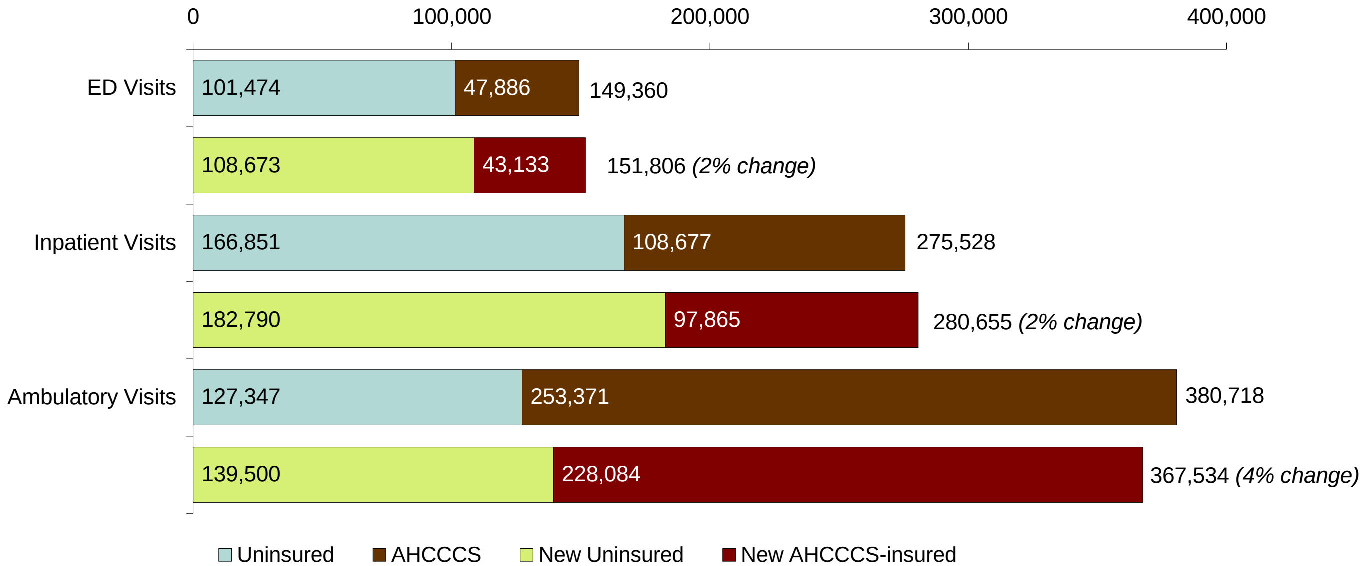
		Number of Services		
Group	*N*	*ED Visits*	*Inpatient Hospital Visits*	*Ambulatory Visits*
Section I: Service Quantities				
1. Uninsured	126,211	0.804	1.322	1.009
2. AHCCCS	106,651	0.449	1.019	2.376
3. AHCCCS as if uninsured	106,651	0.672	1.501	1.136
4. Uninsured as if AHCCCS	126,211	0.528	1.099	2.183
Section II: Decomposing the difference in the quantities of services between AHCCCS-insured and uninsured individuals				
Utilization Differences (Q_U - Q_S) *= line 1 – line 2*		.355	.303	-1.367
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= line 3 – line 2*		.223 62.8%	.482 159.1%	-1.240 90.7%
Difference due to characteristics (explanatory variables) *= line 1 – line 3*		.132 37.2%	-.179 -59.1%	-.127 9.3%

Table 11 applies the results in Table 10 to indicate what the effect of disenrollment of 10% of the currently AHCCCS-enrolled adult population in Maricopa County (all ethnic groups, and both genders) for those with complete data for the analysis indicated in Equations (2), (5), and (6). Table 10 indicates that the uninsured adults have 36 more ED encounters per 100 individuals than do the insured adults; the uninsured adults experience 30 more inpatient days per hundred individuals than the insured, and the uninsured adults have 137 fewer ambulatory office visits per hundred individuals than the insured adults.

Table 11: Adult Total Effect of an AHCCCS Premium Change, Service Utilization

		Number of Services		
	N	*ED Visits*	*Inpatient Hospital Visits*	*Physician Visits*
Uninsured individuals	126,211	101,474	166,851	127,347
AHCCCS-insured individuals	106,651	47,886	108,677	253,371
Total visits = Uninsured + AHCCCS-insured	*232,862*	*149,360*	*275,528*	*380,718*
New uninsured (10% AHCCCS enrollees to uninsured)	136,876	108,673	182,790	139,500
New AHCCCS-insured	95,986	43,133	97,865	228,084
Total visits = New Uninsured + New AHCCCS-insured		*151,806*	*280,655*	*367,534*
Net change in utilization		2,446	5,127	-13,134
Net change in expenditures		**$1,945,964**	**$3,007,242**	**-$2,136,114**

Figure 3: Adult Total Effect of an AHCCCS Premium Change, Service Utilization

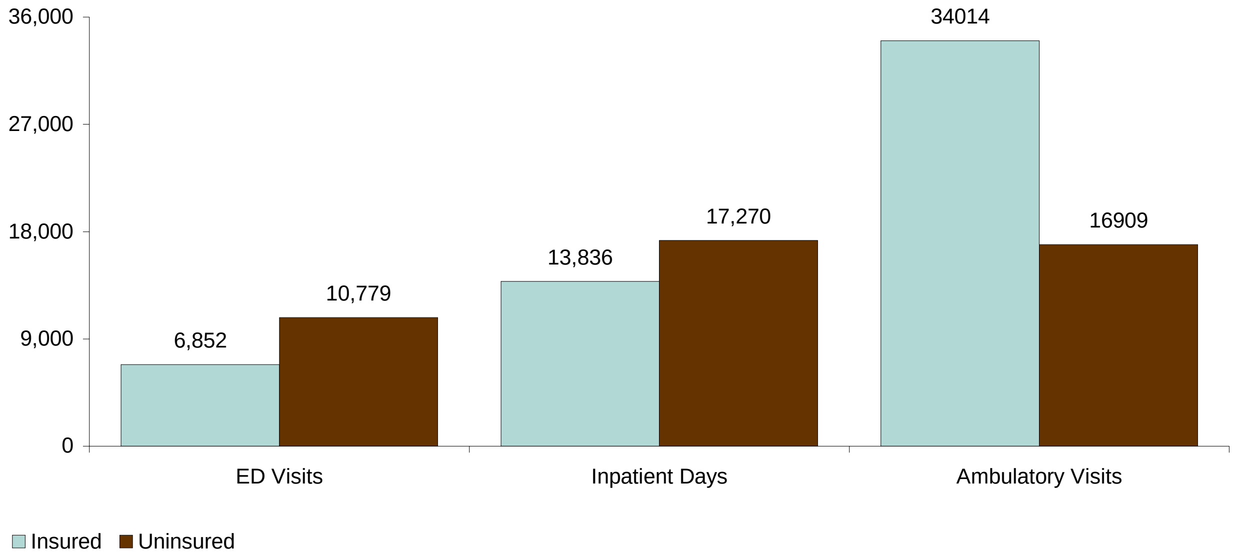


In 2004, the uninsured adults had 101,474 ED visits (computed from Table 10, row one as number of individuals in the sample times the number of encounters per individual, with the other values in rows 1 and 2 calculated similarly), compared to 47,886 for the insured. The uninsured adults had 166,851 inpatient hospital days compared to 108,677 for the AHCCCS-insured adults. Ambulatory office visits, however, were much higher among the AHCCCS insured adults with 253,371 visits compared to 127,347 for the uninsured adults. Applying the mean payments to their respective categories, we find the effect of disenrollment for adults is to increase ED expenditures by $1,945,964, increase inpatient day expenditures by $3,007,242, while lowering office visit expenditures by $2,136,114.Net expenditures increase by $2,817,092, or 0.8% of the total costs of all encounters in this table.

Table 12: Total Effect of an AHCCCS Disenrollment of HIFA Claimants

		Number of Services		
	N	*ED Visits*	*Inpatient Hospital Visits*	*Ambulatory Visits*
Insured services per individual: HIFA sample	16,432	.417	.842	2.070
Insured total number of services: HIFA sample	16,432	6,852	13,836	34,014
Uninsured services per individual: HIFA sample	16,432	.656	1.051	1.029
Uninsured total number of services: HIFA sample	16,432	10,779	17,270	16,909
Net change in utilization *= Uninsured services – insured total*		3,927	3,434	-17,105
Net change in expenditures		**$3,124,203**	**$2,014,213**	**-$2,781,957**

Figure 4: Total Effect of an AHCCCS Disenrollment of HIFA Claimants



In 2004, there were 16,432 people enrolled in AHCCCS through the Health Insurance Flexibility and Accountability (HIFA) waiver program which expanded the SCHIP program to parents of SCHIP enrolled children in Arizona and other adults. Table 12 examines the total effects of disenrollment of this population. In 2004, these enrollees had 6,852 ED visits, 13,836 hospital days and 34,014 ambulatory visits. If these enrollees became uninsured, the number of ED visits would increase to 10,779 and hospital days would increase to 17,270. The simulated response is based on estimates of the average number of encounters (rows 1 and 3) from negative binomial count regression models used in this report, where all data on insured and uninsured were used to estimate the responses, and HIFA sample characteristics were applied to those responses. The overall net increase in ED costs is $3,124,203 and the increase in hospitalization costs in $2,014,213. Because ambulatory visits would decrease, however, the net increase in health care costs is $2,356,459.

Table 13: Child Service Utilization, AHCCCS-Insured and Uninsured Individuals

		Number of Services		
Group	*N*	*ED Visits*	*Inpatient Hospital Visits*	*Ambulatory Visits*
Section I: Service Quantities				
1. Uninsured	40,945	0.667	0.626	0.951
2. AHCCCS	163,273	0.319	0.441	1.915
3. AHCCCS as if uninsured	163,273	0.613	0.511	1.006

4. Uninsured as if AHCCCS	40,945	0.398	0.525	1.897
Section II: Decomposing the difference in the quantities of services between AHCCCS-insured and uninsured individuals				
Utilization Differences (Q_U - Q_S) *= row 1 – row 2*		0.348	0.185	-0.964
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		.294 84.5%	.070 37.8%	-.909 94.3%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		.054 15.5%	.115 62.2%	-.055 5.7%

Table 14 applies the results in Table 13 to indicate what the effect of disenrollment of 10% of the currently AHCCCS-enrolled children population in Maricopa County (all ethnic groups and both genders) for those with complete data for the analysis indicated in Equations (2), (5), and (6). Table 13 indicates that uninsured children have 35 more ED encounters per 100 individuals than do the insured children; the uninsured children experience 19 more hospital days per hundred individuals than the insured children, and the uninsured children have 96 fewer ambulatory office visits per hundred individuals than the insured children.

Table 14: Child Total Effect of an AHCCCS Premium Change, Service Utilization

		Number of Services		
	N	*ED Visits*	*Inpatient Hospital Visits*	*Physician Visits*
Uninsured individuals	40,945	27,310	25,632	38,939
AHCCCS-insured individuals	163,273	52,084	72,003	312,668
Total visits = Uninsured + AHCCCS-insured	*204,218*	*79,394*	*97,635*	*351,607*
New uninsured (10% AHCCCS enrollees to uninsured)	57,272	37,441	34,043	55,192
New AHCCCS-insured	146,946	46,738	64,762	281,597
Total visits = New Uninsured + New AHCCCS-insured		*84,179*	*98,805*	*336,789*
Net change in utilization		4,785	1,170	-14,818
Net change in expenditures		**$3,806,802**	**$686,264**	**-$2,410,000**

In 2004, the uninsured children had 27,310 ED visits (computed from Table 13, row one as number of individuals in the sample times the number of encounters per individual, with the other values in rows 1 and 2 calculated similarly), compared to 52,084 for the insured children. The uninsured children had 25,632 hospital days compared to 72,003 for the AHCCCS-insured children. Ambulatory visits, however, were much higher among the AHCCCS-insured children, 312,607 visits relative to 38,939 for the uninsured children. Applying the mean payments to their respective categories, we find effect of disenrollment for children is to increase ED expenditures by $3,806,802, increase inpatient day expenditures by $686,264, while lowering office visit expenditures by $2,410,000. Net expenditures increase by $2,083,066, or 1.2% of the total costs of all encounters in this table.

Table 15: Hispanic Service Utilization, AHCCCS-Insured and Uninsured Individuals

		Number of Services		
Group	*N*	*ED Visits*	*Inpatient Hospital Visits*	*Ambulatory Visits*
Section I: Service Quantities				
1. Uninsured	78,822	0.586	0.794	1.322
2. AHCCCS	141,323	0.346	0.575	1.877
3. AHCCCS as if uninsured	141,323	0.586	0.577	1.203
4. Uninsured as if AHCCCS	78,822	0.412	0.808	1.904
Section II: Decomposing the difference in the quantities of services between AHCCCS-insured and uninsured individuals				
Utilization Differences (Q_U - Q_S) *= row 1 – row 2*		.240	.219	-.555
Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)				
Difference due to insurance (coefficients) *= row 3 – row 2*		.240 100.0%	.002 0.9%	-.674 121.4%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*		.000 0.0%	.217 99.1%	.119 -21.4%

Table 16 applies the results in Table 15 to indicate what the effect of disenrollment of 10% of the currently AHCCCS-enrolled Hispanic population in Maricopa County (all age groups, and both genders) for those with complete data for the analysis indicated in Equations (2), (5), and (6). As discussed above at the beginning of this section, Table 8 indicates that the uninsured Hispanics have 24 more ED encounters per 100 individuals than do the insured Hispanics; the uninsured Hispanics experience 22 more inpatient days per hundred individuals than the insured Hispanics, and the uninsured Hispanics have 56 fewer ambulatory office visits per hundred individuals than the insured Hispanics.

Table 16: Hispanic Total Effect of an AHCCCS Premium Change, Service Utilization

		Number of Services		
	N	*ED Visits*	*Inpatient Hospital Visits*	*Physician Visits*
Uninsured individuals	78,822	46,190	62,585	104,203
AHCCCS-insured individuals	141,323	48,898	81,261	265,263
Total visits = Uninsured + AHCCCS insured	*220,145*	*95,088*	*143,846*	*369,466*
New uninsured (10% AHCCCS enrollees to uninsured)	92,954	54,439	70,728	121,292
New AHCCCS-insured	127,191	44,071	73,201	238,639
Total visits = New Uninsured + New AHCCCS insured		*98,510*	*143,929*	*359,931*
Net change in utilization		3,422	83	-9,535
Net change in expenditures		**$2,722,441**	**$48,684**	**-$1,550,772**

In 2004, the uninsured Hispanics had 46,190 ED visits (computed from Table 15, row one as number of individuals in the sample times the number of encounters per individual, with the other values in rows 1 and 2 calculated similarly), compared to 48,898 for the insured Hispanics. The uninsured Hispanics had 62,585 inpatient hospital days compared to 81,261 for the AHCCCS-insured Hispanics. Ambulatory office visits, however, were much higher among the AHCCCS-insured Hispanics, 265,263 visits relative to 104,203 for the uninsured Hispanics. Applying the mean payments, we find the effect of disenrollment for Hispanics is to increase ED expenditures by $2,722,441, increase inpatient day expenditures by $48,684, while lowering office visit expenditures by $1,550,772. Net expenditures for Hispanics increase by $1,220,353, or 0.6% of the total costs of all encounters in this table.

Table 17: White Service Utilization, AHCCCS-Insured and Uninsured Individuals

		Number of Services		
Group	*N*	*ED Visits*	*Inpatient Hospital Visits*	*Ambulatory Visits*
Section I: Service Quantities				
1. Uninsured	67,041	0.953	1.636	0.679
2. AHCCCS	86,969	0.420	0.793	2.539
3. AHCCCS as if uninsured	86,969	0.667	1.560	1.032
4. Uninsured as if AHCCCS	67,041	0.575	1.211	2.518
Section II: Decomposing the difference in the quantities of services between AHCCCS-insured and uninsured individuals				
Utilization Differences (Q_U - Q_S) *= row 1 – row 2*		.533	.843	-1.860

Section III: Switching from AHCCCS to uninsured (applying coefficients from uninsured model to the mean characteristics of AHCCCS-insured individuals)			
Difference due to insurance (coefficients) *= row 3 – row 2*	.247 46.3%	.767 91.0%	-1.507 81.0%
Difference due to characteristics (explanatory variables) *= row 1 – row 3*	.286 53.7%	.076 9.0%	-.353 19.0%

Table 18 applies the results in Table 17 to indicate what the effect of disenrollment of 10% of the currently AHCCCS-enrolled White population in Maricopa County (all age groups, and both genders) for those with complete data for the analysis indicated in Equations (2), (5), and (6). The uninsured Whites have 53 more ED encounters per 100 individuals than do the insured Whites; the uninsured Whites experience 84 more inpatient days per hundred individuals than the insured Whites, and the uninsured Whites have 186 fewer ambulatory office visits per hundred individuals than the insured Whites.

Table 18: White Total Effect of an AHCCCS Premium Change, Service Utilization

		Number of Services		
	N	*ED Visits*	*Inpatient Hospital Visits*	*Physician Visits*
Uninsured individuals	67,041	63,890	109,652	45,521
AHCCCS-insured individuals	86,969	36,527	68,966	220,814
Total visits = Uninsured + AHCCCS insured	*154,010*	*100,417*	*178,618*	*266,335*
New uninsured (10% AHCCCS enrollees to uninsured)	75,737	69,709	122,934	54,423
New AHCCCS-insured	78,273	32,807	62,019	198,893
Total visits = New Uninsured + New AHCCCS insured		*102,516*	*184,953*	*253,316*
Net change in utilization		2,099	6,335	-13,019
Net change in expenditures		**$1,669,901**	**$3,715,794**	**-$2,117,410**

In 2004, the uninsured Whites had 63,890 ED visits (computed from Table 17, row one as number of individuals in the sample times the number of encounters per individual, with the other values in rows 1 and 2 calculated similarly), compared to 36,527 for the insured. The uninsured Whites had 109,652 inpatient hospital days compared to 68,966 for the AHCCCS-insured Whites. Ambulatory office visits, however, were much higher among the AHCCCS-insured Whites, 220,814 visits relative to 45,521 for the uninsured Whites. The effect of disenrollment for Whites is to increase ED expenditures by $1,669,901, increase inpatient day expenditures by $3,715,794, while lowering office visit expenditures by $2,117,410. Net expenditures increase by $3,268,285, or 1.4% of the total costs of all encounters in this table.

Discussion - Part I

While there have been previous studies which examined the cost of expanding enrollment in Medicaid or SCHIP programs (Selden, 2005; Gordon, 1994) there has been little research on the costs associated with disenrollment. In a previous analysis of AHCCCS disenrollment of children this research group conducted in Yuma County, Arizona, we concluded that 10% disenrollment from the program could increase the number of uninsured children by 21%, resulting in an overall increase in total health care expenditures of $167,000. This increase in costs was due to a shift in sites of care from less expensive ambulatory office sites to more expensive EDs and increased hospitalizations (Johnson, 2006). The findings from this analysis in Maricopa County are similar. Because the uninsured often are unable to obtain health care in physician's offices, they go to the ED, where they know they cannot be turned away due to the Emergency Medical Treatment and Active Labor Act. However, the cost of non-emergent care provided in the ED is much higher than similar services provided in physician's offices. In addition, the uninsured require more inpatient care services than the insured. The increased need for hospitalizations may be due to delays in seeking care in the hope that their symptoms will resolve without treatment. In addition, they may delay care because they cannot afford the work absences associated with long waits in EDs and the debt incurred by receiving care in this setting.

Part II

SIMPLE MODEL

Assume that each individual *i* has an unobservable "health effect", ν_i , that affects both his insurance choice (Medicaid or uninsured) and the amount of care that he receives from each of three places of service (j=emergency departments, ED; inpatient treatments; and ambulatory care), given his choice of insurance status. The choice of being enrolled in Medicaid is given as

6) $d_{i,t} = I(z_{i,t}\alpha + \nu_i > 0)$

Where *I* is the indicator function, z_i is a vector of individual observable characteristics, and $\varphi(v)$ the density function for the health effect (not necessarily normal). Let the expected number of counts for individual *i* at place of service *j* (j=ED, inpatient treatments, ambulatory care treatments (i.e., doctors' office)) be an exponential function of x_i, a vector of individual characteristics, general health conditions, and provider specialty, and the unobservable "health effect", ν_i :

7) $E(y_{i,j,t}) = \exp(x_{i,t}\beta_j + \nu_i\theta_j) \equiv \lambda_{i,j,t}$

Where the likelihood that an individual *i* will experience $r_{i,j,t}$ number of treatments at place of service *j* at time *t*, is given by the Possion distribution:

8) $\text{Prob}(y_{i,j,t} = r_{i,j,t}) = \exp(-\lambda_{i,j,t})\dfrac{(\lambda_{i,j,t})^{r_{i,j,t}}}{r_{i,j,t}!}$

Conditional on heterogeneity through the health effect, ν_i , $d_{i,t}$ and $y_{i,j,t}$ are independent, so that

$$\text{Prob}(y_{i,j,t}, d_{i,t} = 1 \mid x_{i,j,t}, z_{i,j,t}, \nu_i) = \text{Prob}(y_{i,j,t} \mid x_{i,j,t}, z_{i,j,t}, \nu_i)\,\text{Prob}(d_{i,t} = 1 \mid x_{i,j,t}, z_{i,j,t}, \nu_i)$$

$$\text{Prob}(y_{i,j,t}, d_{i,t} = 0 \mid x_{i,j,t}, z_{i,j,t}, \nu_i) = \text{Prob}(y_{i,j,t} \mid x_{i,j,t}, z_{i,j,t}, \nu_i)\,\text{Prob}(d_{i,t} = 0 \mid x_{i,j,t}, z_{i,j,t}, \nu_i)$$

So with heterogeneity the joint distribution of the selection rule, d, and number of the *j*th type services would be

9)

$$\text{Prob}(y_{i,j,t} = r_{i,j,t}; d_{i,t}) = [\int_{-z\alpha}^{\infty} \exp(-\lambda_{i,j,t})\frac{(\lambda_{i,j,t})^{r_{i,j,t}}}{r_{i,j,t}!}\varphi(\nu_i)d\nu]^{d_{i,t}}\ [\int_{-\infty}^{-z\alpha} \exp(-\lambda_{i,j,t})\frac{(\lambda_{i,j,t})^{r_{i,j,t}}}{r_{i,j,t}!}\varphi(\nu_i)d\nu]^{(1-d_{i,t})}$$

which can also be expressed as follows:

$$\text{Prob}(y_{i,j,t} = r_{i,j,t}; d_{i,t}) = d_{i,t}\int_{-z\alpha}^{\infty} \exp(-\lambda_{i,j,t})\frac{(\lambda_{i,j,t})^{r_{i,j,t}}}{r_{i,j,t}!}\varphi(\nu_i)d\nu + (1-d_{i,t})\int_{-\infty}^{-z\alpha} \exp(-\lambda_{i,j,t})\frac{(\lambda_{i,j,t})^{r_{i,j,t}}}{r_{i,j,t}!}\varphi(\nu_i)d\nu$$

where $\varphi(\nu)$ is the distribution of the unobservable health fixed effect. Then the full likelihood would be this term, with the product taken over the *j* places of service and over the *t* time periods. If exp(ν_i) is gamma distributed and θ_j =1 in equation 7 (so you have a random effects model), then the you get the standard negative binomial distribution for counts when you integrate over ν.

SLIGHTLY LESS SIMPLE MODEL

This is a slightly more complex version of the pervious model, relaxing some of the restrictions placed on the unobservables. Here we generalize equations 6 and 7 slightly

6') $d_{i,t} = I(z_{i,t}\alpha + \varepsilon_{1,i,t} > 0)$

7') $E(y_{i,j,t}) = \exp(x_{i,t}\beta_j + \varepsilon_{2,i,t}\,\theta_j) \equiv \lambda_{i,j,t}$,

where 10) $\varepsilon_{1,i,t} = \rho_1\nu_i + \mu_{1,i,t}$

$$\varepsilon_{2,i,t} = \rho_2 \nu_i + \mu_{2,i,t}$$

as in Mroz, 1999, *Journal of Econometrics*, 92, pp. 233-274, where the μ s have zero mean and are mutually independent (and we normalize the variance of $\mu_1 = 1$ and let the variance of μ_2 be σ^2), and independent of the exogenous variables in the model. The μ s may be normally distributed, but other assumptions are possible. Mroz uses a step function with undetermined support points (a "discrete factorization") to characterize the distribution of ν, but again, other distributions are possible.

With the discrete factorization of ν with k support points and values of η_k such that

11) $\text{Prob}(V = \eta_k) = \pi_k,\ k = 1,...,K$, where $\pi_k > 0$ *and* $\sum_{k=1}^{K} \pi_k = 1.$

Then equation 9 becomes (letting $(\exp(x_{i,t}\beta_j + \nu_i \rho_{2,j} + \mu_2) \equiv \lambda_{i,j,t}$

9') $\text{Prob}(y_{i,j,t} = r_{i,j,t}; d_{i,t}) =$

$$\sum_{k=1}^{K} \pi_k \{d_{i,t} \int_{-z\alpha-\rho_{1,j}\eta_k}^{\infty} \varphi(\mu_1) d\mu_1 \int [\exp(-\exp(x_{i,j,t}\beta_j + \rho_{2,j}\eta_k + \mu_2)) \frac{(\exp(x_{i,j,t}\beta_j + \rho_{2,j}\eta_k + \mu_2))^{r_{i,j,t}}}{r_{i,j,t}!}][\frac{\varphi(\mu_2 / \sigma)}{\sigma}] d\mu_2 +$$

$$(1 - d_{i,t}) \int_{-\infty}^{-z\alpha-\rho_{1,j}\eta_k} \varphi(\mu_1) d\mu_1 \int [\exp(-\exp(x_{i,j,t}\beta_j + \rho_{2,j}\eta_k + \mu_2)) \frac{(\exp(x_{i,j,t}\beta_j + \rho_{2,j}\eta_k + \mu_2))^{r_{i,j,t}}}{r_{i,j,t}!}][\frac{\varphi(\mu_2 / \sigma)}{\sigma}] d\mu_2 \}$$

Now the full likelihood would be this 9' right hand side term, with the product taken over the *j* places of service and over the *t* time periods.

References

Baldwin, M.L., Butler, R.J., & Johnson, W.G. (2001). A hierarchical theory of occupational segregation and wage discrimination. *Economic Inquiry, 39(1):94-110, 21*.

Baldwin, M.L., & Johnson, W.G. (1994). Labor market discrimination against men with disabilities. *Journal of Human Resources, 29(1):1-19.*

Baldwin, M.L., & Johnson, W.G. (1995). Labor market discrimination against women with disabilities. *Industrial Relations, 34(4):555-577.*

Claxton, G., Gil, I., Finder, B., Gabel, J. Pickreign, J., Whitmore, H., & Hawkins, S. (2005, September). *Employer health benefits 2005 Annual Survey*. Menlo Park, California: The Kaiser Family Foundation and Health Research and Educational Trust.

Cotton, J. (1988). On the decomposition of wage differentials. *Review of Economics and Statistics, 70(2):236-243.*

Dunkelberg, A., & O'Malley, M. (2004, July) *Children's Medicaid and SCHIP in Texas: Tracking the impact of budget cuts.* Publication No. 7132. Washington, D.C.: The Kaiser Commission on Medicaid and the Uninsured.

Falik, M., Needleman, J., Wells, B., & Korb, J. (2001). Ambulatory care sensitive hospitalizations and emergency visits: Experiences of Medicaid patients using federally qualified health centers. *Medical Care, 39(6):551-561*.

Gold, M.E., Russell, L.B., Siegal, J.E., & Weinstein, M.C. (Eds.). (1996). Cost effectiveness in health and medicine. New York: Oxford University Press.

Gordon, L.V., & Selden, T.M. (1994). How much did the Medicaid expansions for children cost? An analysis of state Medicaid spending. *Medical Care Research and* Review, 58:482-495.

Hadley, J., & Holahan, J. (2003, February). *Who pays and how much? The cost of caring for the uninsured.* Publication Number 4088. Washington, D.C.: The Kaiser Commission on Medicaid and the Uninsured.

Johnson, T. J., Johnson, W. G., & Rimsza, M.E. (in press) Reducing SCHIP coverage: Saving money or shifting costs? *American Journal of Public Health*.

Johnson, W.G., Baldwin, M.L., & Burton, J.F., Jr. (1996). Why is the treatment of work-related injuries so costly? New evidence from California. *Inquiry, 33(1):53-65, 20.*

Ku L., & Coughlin, T.A. (1999/2000). Sliding scale premium health insurance programs: Four state experiences. *Inquiry, 36(4):471-480*.

LeCouteur, G., Perry, M., Artiga, S., & Rousseau, D.M. (2004, December). *The impact of Medicaid reductions in Oregon: Focus group insights.* Publication Number 7233. Washington, D.C.: The Kaiser Commission on Medicaid and the Uninsured.

Madden, C., Cheadle, A., Diehr, P., Martin, D., Patrick, D., & Skillman, S. (1995). Voluntary public insurance for low-income families: The decision to enroll. *Journal of Health Politics, Policy and Law, 20(4):955-972.*

Means, S.I., & Rubin, R.M. (2004). Is there equity in the home health care market? *Journal of Gerontology, 59B:S220-S229.*

Oaxaca, R. (1973). Male-female wage differences in urban labor markets. *International Economic Review, 9, p. 693-709.*

Rimsza M, Johnson WG, Johnson TJ. Individuals Who Use the Emergency Department as their "Medical Home." School of Health Management and Policy, Arizona State University. Working Paper;2004.

Selden, T.M., & Hudson, J.L. (2005). How much can really be saved by rolling back SCHIP? The net cost of public health insurance. *Inquiry, 42:16-28*.

Shi LH, Samuels ME, Pease M, Bailey W, Corley E. Patient Characteristics Associated with Hospitalizations for Ambulatory Sensitive Conditions in South Carolina. South Med J 1999;92(10):989-998.

Smith, V., Gifford, K., Ellis, E., Wiles, A., Rudowitz, R., & O'Malley, M. (2005). *Medicaid budgets, spending and policy initiatives in state fiscal years 2005-2006, results of a 50 state survey*. Publication Number 7392. Washington, D.C. The Kaiser Commission on Medicaid and the Underinsured.

Sommers, B.D. (2005). From Medicaid to uninsured: Drop-out among children in public insurance programs. *Health Services Research, 40(1):59-78.*