

Effect of Critical Access Hospital Conversion on Patient Safety: Appendix

Table S11. Quadchk Results for PSI-2 and PSI-5:

Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	PSI-2				PSI-5			
	Model using CAH		Model using CAH		Model using CAH		Model using CAH	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	0	-1.39E-15	5.95E-16	-7.94E-16	3.10E-12	3.10E-12	3.10E-12	3.10E-12
CAH/CAHmv	8.44E-16	8.44E-16	-5.07E-16	-7.60E-16	2.38E-11	2.38E-11	2.38E-11	2.38E-11
% Medicare days	1.92E-15	1.71E-15	-3.17E-15	-3.38E-15	2.38E-11	2.38E-11	2.38E-11	2.38E-11
% Medicaid days	3.21E-15	2.83E-15	-2.72E-15	-3.88E-15	-2.52E-11	-2.52E-11	-2.52E-11	-2.52E-11
% of surgical discharges	-3.13E-15	-4.13E-15	1.04E-14	7.51E-15	1.80E-11	1.80E-11	1.80E-11	1.80E-11
Charlson Index	9.37E-16	3.75E-16	-1.83E-15	-1.83E-15	1.82E-11	1.82E-11	1.82E-11	1.82E-11
Market concentration (HHI)	1.01E-14	3.51E-15	2.60E-15	8.22E-15	1.53E-11	1.53E-11	1.53E-11	1.53E-11
Per capita income (\$1,000)	8.00E-16	1.40E-15	-5.98E-16	-3.39E-15	7.17E-12	7.17E-12	7.17E-12	7.17E-12
Population density	2.58E-15	1.36E-15	-2.17E-15	1.24E-15	2.09E-11	2.09E-11	2.09E-11	2.09E-11
y1998	2.58E-15	2.58E-15	-2.78E-15	-2.23E-15	3.76E-11	3.76E-11	3.76E-11	3.76E-11
y1999	0.049992	0.033571	0.033581	0.173835	1.64E-11	1.64E-11	1.64E-11	1.64E-11
y2000	0.049945	0.033548	0.033583	0.173723	2.76E-11	2.76E-11	2.76E-11	2.76E-11
y2001	2.49E-15	2.15E-15	-2.17E-15	2.71E-16	1.50E-11	1.50E-11	1.50E-11	1.50E-11
y2002	3.15E-15	2.40E-15	-5.34E-15	-3.01E-15	1.08E-11	1.08E-11	1.08E-11	1.08E-11
y2003	3.69E-15	2.58E-15	-2.84E-15	-7.74E-16	3.46E-11	3.46E-11	3.46E-11	3.46E-11
y2004	3.98E-15	4.44E-15	-4.76E-15	-7.00E-16	1.55E-11	1.55E-11	1.55E-11	1.55E-11
Intercept	1.76E-15	1.94E-15	-2.30E-15	-3.00E-15	1.88E-11	1.88E-11	1.88E-11	1.88E-11

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points

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Table S12. Quadchk Results for PSI-3:

Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	Risk-adjusted rate				Observed rate			
	Model using CAH		Model using CAHmv		Model using CAH		Model using CAHmv	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	-0.00024	2.25E-05	-0.00026	2.39E-05	-6.6E-05	1.26E-06	-7.3E-05	2.22E-06
CAH/CAHmv	-0.01971	0.003271	-0.00978	0.001276	-0.03382	0.004424	-0.01716	0.002162
% Medicare days	0.004824	0.005627	0.008113	0.004656	-0.01642	0.000975	-0.01121	0.000635
% Medicaid days	0.001918	0.00248	0.006449	0.00161	-0.0157	-0.00054	-0.01446	-0.00083
% of surgical discharges	0.155261	-0.02083	0.335955	-0.0418	0.021725	-0.00236	0.059628	-0.00687
Charlson Index	0.004373	-0.00152	0.002482	-0.00148	-0.00786	0.000159	-0.00538	-4.7E-05
Market concentration (HHI)	-0.00994	0.013447	-0.00162	0.007854	0.038312	0.004791	0.04075	0.004197
Per capita income (\$1,000)	-0.00518	0.001915	-0.00666	0.002033	-0.00535	-0.00014	-0.00623	-6.5E-05
Population density	-0.04392	0.013733	-0.04582	0.0122	-0.10122	0.006297	-0.10464	0.007027
y1998	0.001306	-0.00049	0.002109	-0.00058	-0.00016	2.75E-05	7.64E-05	6.71E-07
y1999	0.002462	-0.00054	0.003178	-0.00063	0.00031	-1.4E-05	0.000492	-3.7E-05
y2000	0.005311	-0.00121	0.006989	-0.00142	0.000873	0.000105	0.001721	-1.22E-06
y2001	0.002294	-0.00053	0.004807	-0.00089	-4.67E-06	0.000106	0.000605	4.73E-06
y2002	-0.00119	-0.00129	0.004572	-0.00198	-0.03479	0.008696	-0.01022	0.002829
y2003	0.00092	-0.00135	0.004771	-0.00164	-0.00217	0.000827	-0.002	0.000691
y2004	0.000765	-0.00037	0.001997	-0.00061	-0.00359	0.001009	-0.00356	0.000852
Intercept	0.000537	0.000373	-0.00084	0.000772	-0.01337	-0.0011	-0.01356	-0.00109

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points

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Table S13. Quadchk Results for PSI-6:

Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	Risk-adjusted rate				Observed rate			
	Model using CAH		Model using CAHmv		Model using CAH		Model using CAHmv	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	2.29E-13	2.28E-13	2.12E-13	2.11E-13	2.53E-13	2.52E-13	2.29E-13	2.29E-13
CAH/CAHmv	2.63E-12	2.63E-12	2.63E-12	2.63E-12	3.36E-12	3.36E-12	3.24E-12	3.25E-12
% Medicare days	2.61E-12	2.60E-12	2.44E-12	2.43E-12	2.85E-12	2.85E-12	2.59E-12	2.59E-12
% Medicaid days	3.08E-12	3.08E-12	2.71E-12	2.71E-12	3.22E-12	3.22E-12	2.83E-12	2.83E-12
% of surgical discharges	2.36E-12	2.36E-12	2.15E-12	2.15E-12	2.63E-12	2.63E-12	2.39E-12	2.39E-12
Charlson Index	3.54E-12	3.54E-12	3.33E-12	3.33E-12	2.97E-12	2.97E-12	2.67E-12	2.67E-12
Market concentration (HHI)	1.53E-12	1.53E-12	1.44E-12	1.45E-12	1.90E-12	1.90E-12	1.77E-12	1.78E-12
Per capita income (\$1,000)	-2.34E-11	-2.33E-11	1.79E-10	1.78E-10	3.05E-10	3.01E-10	2.64E-11	2.65E-11
Population density	2.53E-12	2.53E-12	2.32E-12	2.32E-12	3.07E-12	3.07E-12	2.76E-12	2.76E-12
y1998	1.49E-12	1.49E-12	1.37E-12	1.37E-12	1.81E-12	1.81E-12	1.64E-12	1.64E-12
y1999	1.18E-12	1.18E-12	1.06E-12	1.06E-12	1.54E-12	1.54E-12	1.36E-12	1.36E-12
y2000	-5.33E-12	-5.33E-12	-3.00E-12	-3.00E-12	-6.04E-12	-6.01E-12	-3.44E-12	-3.46E-12
y2001	-1.11E-12	-1.10E-12	-1.78E-13	-1.77E-13	-1.60E-12	-1.59E-12	-2.10E-13	-2.14E-13
y2002	1.48E-12	1.48E-12	1.28E-12	1.28E-12	2.07E-12	2.08E-12	1.75E-12	1.75E-12
y2003	3.90E-12	3.90E-12	4.53E-12	4.52E-12	4.86E-12	4.85E-12	5.31E-12	5.32E-12
y2004	1.02E-12	1.02E-12	9.40E-13	9.42E-13	1.21E-12	1.21E-12	1.14E-12	1.14E-12
Intercept	2.12E-12	2.12E-12	1.90E-12	1.90E-12	2.56E-12	2.57E-12	2.27E-12	2.27E-12

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points

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Table S14. Quadchk Results for PSI-7:

Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	Risk-adjusted rate				Observed rate			
	Model using CAH		Model using CAHmv		Model using CAH		Model using CAHmv	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	3.04E-13	3.03E-13	3.51E-13	3.51E-13	1.07E-13	1.07E-13	1.27E-13	1.26E-13
CAH/CAHmv	3.15E-12	3.14E-12	4.07E-12	4.06E-12	1.21E-12	1.18E-12	1.58E-12	1.56E-12
% Medicare days	2.52E-12	2.46E-12	3.08E-12	3.03E-12	1.17E-12	9.86E-13	1.37E-12	1.23E-12
% Medicaid days	3.12E-12	3.09E-12	3.51E-12	3.49E-12	1.21E-12	1.14E-12	1.35E-12	1.29E-12
% of surgical discharges	4.89E-12	5.58E-12	6.11E-12	7.01E-12	3.62E-13	1.24E-12	3.53E-13	1.29E-12
Charlson Index	2.22E-12	2.20E-12	2.69E-12	2.68E-12	7.87E-13	7.23E-13	9.41E-13	8.94E-13
Market concentration (HHI)	1.49E-11	1.45E-11	1.54E-11	1.52E-11	-3.48E-12	-3.20E-12	-4.61E-12	-4.57E-12
Per capita income (\$1,000)	2.48E-12	2.39E-12	2.86E-12	2.79E-12	1.15E-12	9.08E-13	1.28E-12	1.07E-12
Population density	9.68E-12	1.02E-11	1.07E-11	1.11E-11	1.81E-12	2.85E-12	2.25E-12	3.21E-12
y1998	1.79E-12	1.79E-12	2.04E-12	2.04E-12	6.87E-13	6.71E-13	7.82E-13	7.76E-13
y1999	2.07E-12	2.03E-12	2.40E-12	2.37E-12	9.15E-13	8.15E-13	1.04E-12	9.59E-13
y2000	2.15E-12	2.11E-12	2.45E-12	2.43E-12	8.80E-13	7.90E-13	9.89E-13	9.18E-13
y2001	3.62E-12	3.73E-12	7.02E-12	7.25E-12	1.05E-12	1.30E-12	1.83E-12	2.37E-12
y2002	1.99E-12	1.96E-12	2.15E-12	2.13E-12	8.07E-13	7.22E-13	8.56E-13	7.92E-13
y2003	1.74E-13	-1.88E-14	-2.05E-12	-2.28E-12	4.50E-13	-1.30E-14	-2.37E-13	-8.13E-13
y2004	2.29E-12	2.25E-12	2.67E-12	2.64E-12	9.48E-13	8.47E-13	1.09E-12	1.00E-12
Intercept	3.12E-12	3.11E-12	3.58E-12	3.58E-12	1.14E-12	1.10E-12	1.30E-12	1.27E-12

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points

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Table S15. Quadchk Results for PSI-15 (Original models in the paper and Model 1 in sensitivity analyses):
Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	Risk-adjusted rate				Observed rate			
	Model using CAH		Model using CAHmv		Model using CAH		Model using CAHmv	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	-7.8E-05	8.80E-06	-7E-05	8.83E-06	-0.00015	1.57E-06	-0.00016	2.96E-06
CAH/CAHmv	-0.01081	0.000368	-0.01245	0.000442	0.004131	0.001484	-0.0004	0.001756
% Medicare days	0.012553	-9.6E-05	0.012234	-0.00017	0.009795	0.005262	0.012001	0.005243
% Medicaid days	-0.02271	0.000534	-0.02423	0.000607	-0.00117	-0.00619	-0.0041	-0.00665
% of surgical discharges	-0.00834	0.001298	-0.00758	0.001221	0.009722	-0.00123	0.009438	-0.00103
Charlson Index	0.005202	-2.9E-05	0.005368	-6.1E-05	0.01657	-0.0027	0.017157	-0.00293
Market concentration (HHI)	-0.458	0.028565	-0.34346	0.019577	0.024935	-0.20765	0.068421	-0.23852
Per capita income (\$1,000)	-0.03276	0.002455	-0.03111	0.002359	-0.00713	-0.00741	0.004505	-0.00695
Population density	-0.14642	0.016255	-0.15653	0.017312	-0.01731	0.004451	-0.01947	0.004187
y1998	0.004247	-0.0002	0.003508	-0.00015	-0.0068	0.00296	-0.0072	0.002946
y1999	-0.00097	2.81E-05	-0.00102	2.84E-05	0.005491	-0.00174	0.006395	-0.00169
y2000	0.003225	-6E-05	0.004173	-8.8E-05	0.00988	-0.00279	0.012257	-0.00311
y2001	-0.00599	0.000396	-0.00577	0.000431	0.012194	-0.00126	0.014081	-0.00135
y2002	-0.00448	0.000633	-0.00347	0.00051	-0.00798	0.001821	-0.00697	0.001706
y2003	-0.00873	0.001157	-0.00335	0.000895	-0.02122	0.00451	-0.02262	0.004834
y2004	-0.00316	0.000449	-0.00117	0.000381	-0.00797	0.001603	-0.00697	0.001447
Intercept	-0.02498	0.001699	-0.0238	0.00158	0.012083	0.001417	0.009111	0.001196

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points

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Table S16. Quadchk Results for Composite score of 4PSIs:

Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	Risk-adjusted rate				Observed rate			
	Model using CAH		Model using CAHmv		Model using CAH		Model using CAHmv	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	-5.4E-05	2.52E-06	-5.7E-05	3.13E-06	-6.3E-05	-2.8E-05	-7.1E-05	-2.7E-05
CAH/CAHmv	0.000647	-1.7E-05	-0.00242	0.000274	0.008686	0.000382	0.003983	0.000579
% Medicare days	0.00722	-0.00167	0.00752	-0.00217	0.045267	-0.00056	0.049628	-0.0013
% Medicaid days	-0.01429	-0.00086	-0.01599	-0.00072	-0.01667	-0.01295	-0.02093	-0.01437
% of surgical discharges	-0.00083	0.000515	0.00075	0.000466	-0.01333	-0.00484	-0.01533	-0.00526
Charlson Index	0.004247	-0.00133	0.004762	-0.00157	0.001023	-0.00549	0.000687	-0.00668
Market concentration (HHI)	-0.67387	0.022397	-0.50062	0.014781	-0.17514	0.003343	-0.15522	0.014088
Per capita income (\$1,000)	-0.01712	0.001103	-0.01526	0.001277	0.107578	-0.0495	0.134574	-0.0353
Population density	-0.2652	0.039644	-0.26635	0.038001	0.06542	0.002505	0.071235	0.001773
y1998	0.003005	0.000578	0.004884	0.000576	0.000737	0.00225	0.000401	0.00226
y1999	-0.00038	-0.00013	-0.00051	-0.00014	0.003007	-0.01396	0.004389	-0.01481
y2000	0.003581	-0.00032	0.003784	-0.00046	-0.06676	-1.16302	0.007773	0.083439
y2001	0.000442	0.000131	-0.00055	0.000318	0.001379	-0.013	-0.00795	-0.0201
y2002	-0.00459	0.00024	-0.0021	7.59E-05	-0.00807	0.002055	-0.0065	0.001905
y2003	-0.00792	-0.00047	0.004586	-0.00155	-0.00184	0.005651	0.001892	0.005831
y2004	-0.002	-6.6E-05	-0.00014	-0.00023	-0.00438	0.001474	-0.00292	0.00128
Intercept	-0.02341	0.001222	-0.02216	0.001258	-0.02264	-0.00414	-0.03415	-0.00659

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points

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Table S17. Quadchk Results for Composite score of 6PSIs:

Relative Difference⁺ of Coefficients in 8 or 16 Quadrature Points Compared with Original Coefficients[†]

	Risk-adjusted rate				Observed rate			
	Model using CAH		Model using CAHmv		Model using CAH		Model using CAHmv	
	8 points	16 points	8 points	16 points	8 points	16 points	8 points	16 points
Log Likelihood	-5.7E-05	4.54E-05	-6.1E-05	4.42E-05	0.000103	1.48E-05	8.36E-05	1.7E-05
CAH/CAHmv	-0.0125	-0.00205	0.008201	-0.00334	-0.06481	0.006112	-0.01772	0.002049
% Medicare days	0.075761	-0.00099	0.104428	0.003277	0.038014	0.00191	0.11779	-0.0055
% Medicaid days	0.020506	-0.00131	0.019134	-0.00149	0.036787	-0.00775	0.041083	-0.00932
% of surgical discharges	0.083496	-0.01195	0.060963	-0.0044	0.112498	-0.02479	0.139682	-0.02971
Charlson Index	-0.00635	-0.00577	-0.00953	-0.00314	-0.00279	-0.00253	0.004413	-0.0027
Market concentration (HHI)	-0.01351	0.017289	0.076128	0.022211	-0.08894	0.029444	-0.05503	0.030123
Per capita income (\$1,000)	0.003413	0.003768	0.003495	0.003334	-0.01895	0.001178	-0.02012	0.000388
Population density	-0.20242	0.045405	-0.18239	0.049764	-0.34128	0.048581	-0.28121	0.049895
y1998	0.002474	-0.00232	0.000611	-0.00216	0.008921	-0.00174	0.008949	-0.00147
y1999	0.004923	-0.00185	0.004268	-0.00174	0.00911	-0.00174	0.008597	-0.00167
y2000	0.018574	-0.01101	0.007707	-0.00772	0.03421	-0.007	0.033777	-0.00639
y2001	0.010179	-0.00209	0.008862	-0.00187	0.019187	-0.00339	0.01559	-0.00289
y2002	-0.01405	-0.01425	0.00825	-0.00921	-0.02668	0.007352	0.069683	-0.00828
y2003	-0.00234	0.619844	0.023007	-0.01407	-0.05576	0.011865	0.048211	-0.00644
y2004	-0.00715	-0.00755	0.007133	-0.00544	0.00693	-0.00266	0.004246	-0.00067
Intercept	0.03209	-0.00543	0.012437	-0.00546	0.039203	-0.01522	0.034764	-0.01868

+ Relative difference=(coefficient in 8 or 16 quadrature points- original coefficient)/ original coefficients

† In 12 quadrature points