VIII.A. Data Availability

VIII.A.1. What is the availability of data in existing data systems? How readily are the data available?

Informed Coverage is designed to be used with the Medicaid Analytic eXtract (MAX) or similar administrative datasets. However, states and programs do not have consistent reporting standards when contributing to MAX. Some states do not report enrollment data, and none reports claims for their state funded (S-CHIP) programs. For children enrolled in Medicaid or M-CHIP, states report the number of days that a child is enrolled which is used in a decision rule determining whether a child is considered covered. Since this information is not included with any of the states that do report S-CHIP status, children are considered to be "enrolled" for the whole month if they have evidence of S-CHIP enrollment via a monthly indicator in the MAX data. In states that do not report S-CHIP enrollment to MAX, we must assess only the Medicaid and M-CHIP children to estimate enrollment. Additionally, while some states usually provide managed care claims, others do not (Byrd and Verdier 2011; Levinson 2009). For this reason, particularly as the appendicitis natural experiment used to create Informed Coverage requires use of claims data, which may be missing or incomplete in states with high managed care populations, we developed a filter to assess data quality and determine whether Informed Coverage may be implemented in a given state and year. We also analyzed the metric's robustness to unobserved data, in order to be used in states that do not report S-CHIP enrollment data.

Testing managed care claims data quality in each state

Managed care claims data is sometimes absent from MAX, and what managed care data is reported is not always validated before inclusion. In order to address this problem, we review the managed care (MC) data reporting relative to fee for service (FFS) or primary care case management (PCCM) systems for inpatient appendicitis claims in each state, as will be described, in order to select states with apparently adequate data reporting.

In each state, children who had an appendectomy over the course of a calendar year were compared to children who did not have an appendectomy by evaluating their proportions of managed care coverage to determine whether the appendectomy population was comparable to the overall state population in each insurance type. Each child with an appendectomy was matched to 10 children who did not have an appendectomy via Mahalanobis distance optimal matching (Rosenbaum 2010) with a distance matrix that included age and also exact matched on gender, which generated a control pool of children that had the same gender and a nearly, if not identical, date of birth to their matched counterpart. These two factors were chosen as the most clinically relevant risk factors of appendicitis (Addiss et al. 1990). For each child with an appendectomy, to avoid bias of retroactive coverage, a point-in-time four months before the date of appendectomy admission was used to determine whether the child was covered via FFS/PCCM or MC and the same month was used for their non-appendectomy matched counterpart. In order to give some leniency to a chance imbalance between the managed care rate in the appendectomy children and that found in the matched controls, the difference in the rates was compared to a clinically relevant difference instead of testing whether the rates are equal. In the context of noninferiority testing (Wellek 2010), a

state was deemed to not have sufficient appendectomy claims generated in their managed care population if the 95% confidence interval for the managed care rate in the appendectomy children minus the rate in the matched controls was completely below -2%. Six states were considered to have lower than allowable rates of managed care in their appendectomy population and thus were eliminated from future analyses: Kentucky, Massachusetts, Mississippi, Ohio, Pennsylvania, and West Virginia. Additionally, Maine and the District of Columbia were found to have excessive quality issues in their inpatient records and were likewise eliminated. Details of this validation process are included in the Appendix.

APPENDIX XIa: Matched analysis of managed care and fee-for-service appendicitis claims in all states

Examining Robustness to Unobserved Data: S-CHIP reporting

One potential problem regarding across state consistency of data involves the heterogeneous reporting of S-CHIP data. Of the 43 states we analyzed, 18 states reported S-CHIP data to MAX. Twenty-five states did not report this information on a monthly basis (for the purposes of this analysis, we treated states that only had M-CHIP programs, for which we have complete data, as states that did not report S-CHIP, as they appear in the MAX data in the same way). We could therefore ask how Informed Coverage, the Continuity Ratio and the Duration metric would change if, in the 18 states that reported this information, we pretended they did not report the information, thereby changing their relative ranks to the other states. The correlation between with and without the S-CHIP data in these 18 states was 0.973, 0.955 and 0.973 for Informed Coverage, and Duration, respectively. Furthermore, the rank correlation between all 43 states was 0.982, 0.944 and 0.979 respectively, when comparing the use of S-CHIP information to not using it. As can be seen, it would appear that the use of appendicitis to inform Coverage produced an algorithm slightly less influenced by missing S-CHIP information than the other metrics. This likely is because in patients who had S-CHIP but were not identified in the data, the Informed Coverage metric had already assessed these patients as ineligible for Medicaid because they had other coverage, and did not penalize the states with high S-CHIP coverage as much as the other metrics, whereas in the Continuity Ratio and Duration metrics, patients not recognized as being without Medicaid because they were placed on S-CHIP would tend to reduce the estimate of enrollment success. Graphs describing these changes are provided in the Appendix.

APPENDIX XIb: Testing robustness to unobserved S-CHIP data

APPENDIX XI: Testing data quality in each state

APPENDIX XIa: Matched analysis of managed care and fee-for-service appendicitis claims in all states

Results of matched analysis comparing reported appendicitis claims for managed care and fee-for-service patients in each state. States were eliminated if the entire 95% CI for the rate of reported claims for appendicitis in managed care plans minus the rate in the matched controls was below -2%. States highlighted in Gray did not meet criteria to be utilized for studying appendectomy claims. Data assessed on calendar year 2008.

- **FFS:** Fee-for-Service, or plans that report claims as FFS, such as Primary Care Case Management
- **MC:** Managed Care, capitated comprehensive managed care plans
- **Matched Case-Control Groups:** Children who had an appendectomy over the course of a calendar year (**cases**) were matched to ten children who did not have an appendectomy (**controls**) on age and gender, and the proportions of MC and FFS in each group were compared in order to ensure the managed care proportion among the appendectomy children is comparable to the proportion in the state as a whole. This provides a check on the completeness of managed care data in each state.

State	State Apx N	State Apx rate	Case FFS	Case MC	Control FFS	Control MC	FFS % diff	MC % diff	95% CI
AK	76	0.0945%	63	0	606	0	0.00%	0.00%	NA*
AL	258	0.0559%	180	44	1783	386	-1.85%	1.85%	(-3.33,7.03)
AR	253	0.0595%	212	13	1973	200	3.43%	-3.43%	(-6.73,-0.12)
AZ	943	0.1336%	95	596	988	6046	-0.30%	0.30%	(-2.35,2.94)
CA	3763	0.0853%	333	2658	2925	27436	1.50%	-1.50%	(-2.67,-0.33)
CO	194	0.0652%	23	95	190	1172	5.54%	-5.54%	(-12.95,1.87)
CT	43	0.0167%	21	1	332	47	7.86%	-7.86%	(-20.21,4.50)
DC^	2	0.0027%	0	0	2	15	NA	NA	NA
DE	9	0.0106%	2	6	10	59	10.51%	-10.51%	(-38.21,17.20)
FL	785	0.0469%	107	359	1273	4659	1.50%	-1.50%	(-5.33,2.33)
GA	300	0.0308%	10	202	148	2090	-1.90%	1.90%	(-0.96,4.76)
HI	27	0.0244%	1	23	16	222	-2.56%	2.56%	(-6.55,11.66)
IA	97	0.0392%	53	31	426	349	8.13%	-8.13%	(-19.26,3.00)
ID	140	0.1057%	85	9	964	74	-2.45%	2.45%	(-3.26,8.15)
IL	945	0.0716%	812	67	7432	942	3.63%	-3.63%	(-5.51,-1.74)
IN	218	0.0353%	43	131	357	1388	4.25%	-4.25%	(-10.92,2.41)
KS	129	0.0574%	15	82	177	828	-2.15%	2.15%	(-5.11,9.40)
KY	308	0.0704%	182	87	1519	1054	8.62%	-8.62%	(-14.63,-2.61)
LA	381	0.0547%	350	0	3527	0	0.00%	0.00%	NA
MA	99	0.0236%	63	17	317	464	38.16%	-38.16%	(-47.12,-29.20)
MD	246	0.0518%	15	191	120	2013	1.66%	-1.66%	(-5.38,2.07)
ME^									

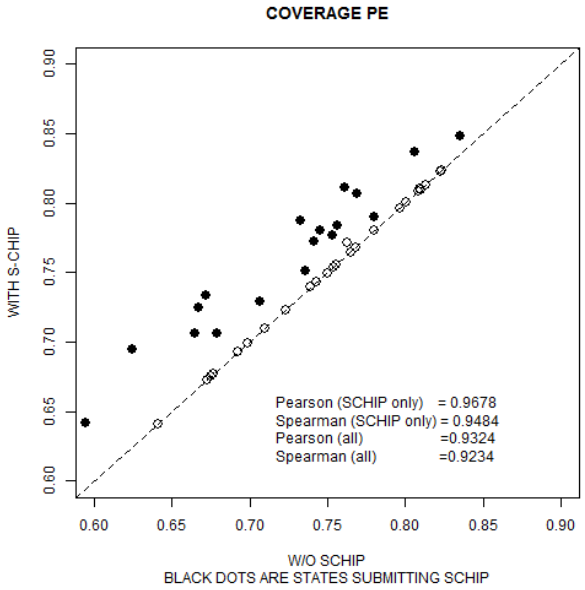
MI	223	0.0220%	9	140	39	1880	4.01%	-4.01%	(-7.81,-0.21)
MN	245	0.0616%	52	121	557	1455	2.37%	-2.37%	(-9.51,4.76)
MO	349	0.0645%	122	167	1061	1797	5.09%	-5.09%	(-11.14,0.96)
MS	165	0.0426%	52	83	418	927	7.44%	-7.44%	(-10.31,-4.57)
MT	49	0.0872%	30	0	365	0	0.00%	0.00%	NA
NC	548	0.0661%	387	2	4237	19	-0.07%	0.07%	(-0.67,0.81)
ND	28	0.0727%	21	0	210	0	0.00%	0.00%	NA
NE	79	0.0490%	14	47	192	448	-7.05%	7.05%	(-4.15,18.25)
NH	41	0.0546%	36	0	331	0	0.00%	0.00%	NA
NJ	477	0.0846%	30	364	414	3597	-2.71%	2.71%	(-0.11,5.52)
NM	319	0.1029%	67	204	581	2212	3.92%	-3.92%	(-9.28,1.44)
NV	72	0.0394%	3	25	50	468	1.06%	-1.06%	(-12.81,10.69)
NY	1285	0.0707%	165	984	2278	8826	-6.15%	6.15%	(3.99,8.32)
OH	73	0.0064%	27	10	125	508	53.23%	-53.23%	(-68.14,-38.31)
OK	421	0.0869%	38	317	352	3213	0.83%	-0.83%	(-4.15,2.49)
OR	196	0.0805%	17	125	158	1209	0.41%	-0.41%	(-6.08,5.26)
PA	138	0.0137%	93	9	279	887	67.25%	-67.25%	(-73.63,-60.87)
RI	83	0.0908%	0	66	100	575	-14.81%	14.81%	NA
SC	160	0.0337%	13	110	163	1150	-1.85%	1.85%	(-3.98,7.67)
SD	45	0.0571%	36	0	370	0	0.00%	0.00%	NA
TN	244	0.0354%	0	214	0	2169	0.00%	0.00%	NA
TX	2929	0.1010%	1074	962	11093	11686	4.05%	-4.05%	(-6.29,-1.81)
UT	95	0.0562%	0	53	14	615	-2.23%	2.23%	NA
VA	204	0.0427%	61	99	500	1150	7.82%	-7.82%	(-15.62,-0.02)
VT	43	0.0802%	39	0	364	0	0.00%	0.00%	NA
WA	443	0.0693%	5	377	11	3717	1.01%	-1.01%	(-2.17,0.14)
WI	238	0.0567%	63	131	564	1202	0.54%	-0.54%	(-7.62,6.54)
WV	32	0.0177%	21	3	66	190	61.72%	-61.72%	(-75.09,-48.34)
WY	31	0.0566%	27	0	243	0	0.00%	0.00%	NA

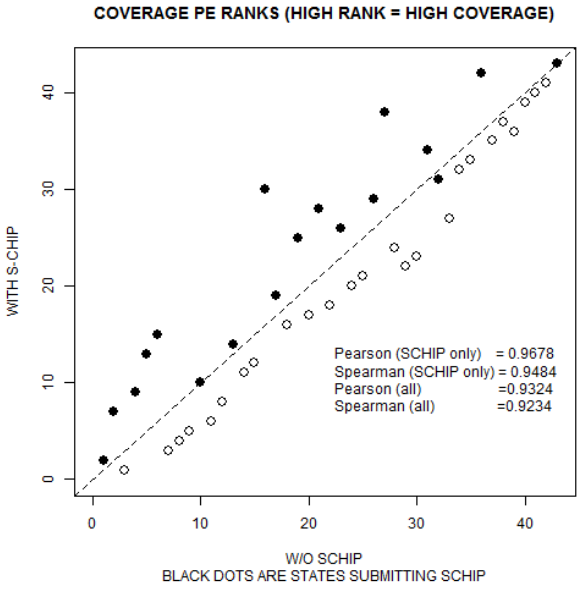
*States marked "NA" do not have any managed care health plans in place. All claims data in these states is reported via FFS or PCCM, wherein claims are billed as FFS.

^In 2008, the state of Maine was excluded because, due to a lack of a functional MMIS system, they do not report any inpatient claims. The District of Columbia also did not submit a complete dataset to CMS.

APPENDIX XIb: Testing robustness to unobserved S-CHIP data

Coverage PE





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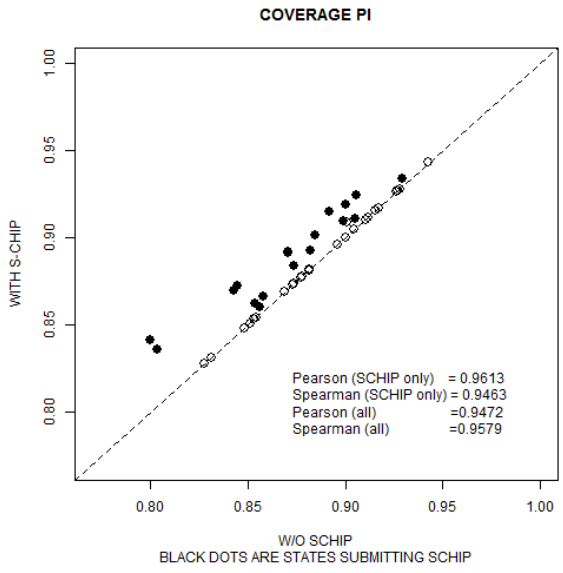
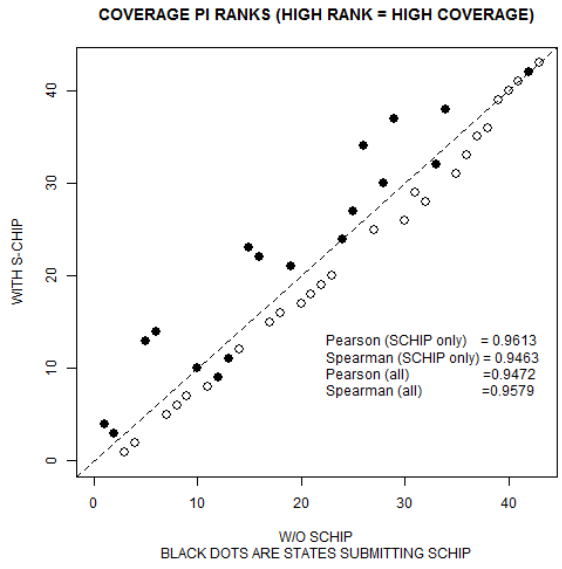
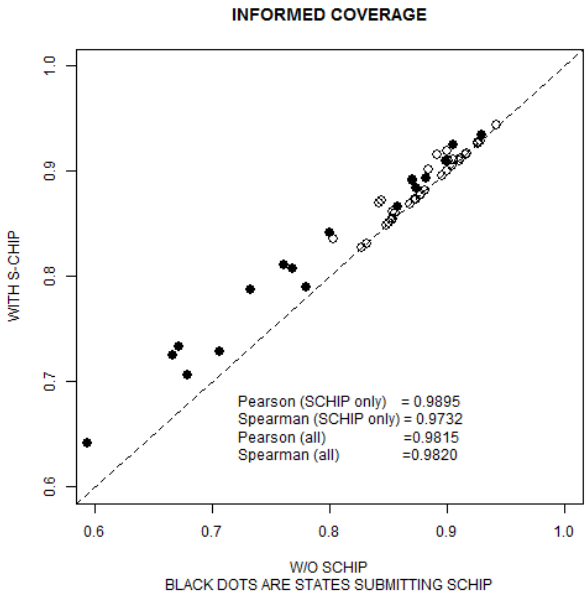
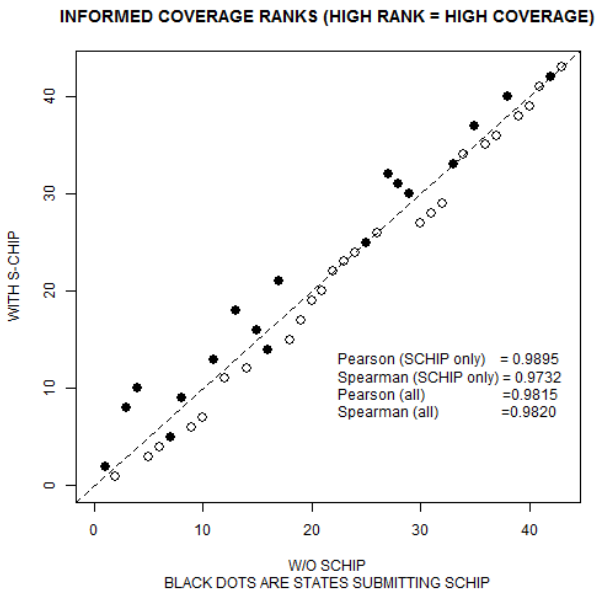




Informed Coverage





Duration