What league are you in?

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Hospitals differ

- In the services they provide
- In the communities they serve
- In the skills and abilities of their staff and their managers, and the facilities within which they work
- It is hardly surprising that they differ in the outcomes of the care provided, including the likelihood of dying during a hospital stay

There is nothing new here

- Variations in hospital mortality were discussed at length by Florence Nightingale.
- The USA National Halothane study demonstrated surprisingly large inter-hospital differences in outcomes in the 1960's,
- Interest was ignited by the publication of risk adjusted hospital mortality rates by the USA HCFA in the 1980's

Publication of hospital mortality

- Open access to hospital mortality rates, amongst a raft of other measures, is now increasingly common in the USA, the norm in the UK and Canada, and is already undertaken by public hospitals in Queensland.

What kind of measure

- There is no point simply reporting numbers of patients who die in hospitals.
- The issue is the rate (eg numbers per 100 patients treated) of death
- And is that rate more less than would be expected, given the kinds of patients treated?

So what?

- Even if we were comfortable with how hospital mortality was measured, so what?
- Mortality is (thankfully) a relatively rare outcome for a hospital stay
- And it may not tell an individual much about the people providing their treatment
- So mortality rates are relevant only in so far as they act as indicators, or point towards, some larger issue.

Safety and quality

- Hospitals with higher than expected mortality rates can legitimately be assumed to be less safe (protect their patients from harm) than others
- Quality is a much more slippery concept.

Reliability and validity

- Indicators are only of interest if they are reliable:
- A reliable measure, when repeated, will generate similar values, providing nothing else has changed.

Reliability and validity

The fact of death is usually accurately determined and reported.

A common criticism of mortality rates as indicators is that so many important determinants are missed that differences between hospitals (not matter how large) will just reflect random variations in patient characteristics

i.e Mortality and other adverse event indicators are inherently unreliable measures.

Risk adjustment

One obvious source of variation is patient level variations in risk.

- Risk adjustment is the process of adjusting outcomes (eg mortality) for the fact that not all patients are at equal risk for a particular outcome.
- It is a method of weighting a hospital's casemix

Risk adjustment

- Is a hospital with a death rate of 3 per hundred patients (80 of whom have knee arthroscopies, and 20 are elderly patients with complex problems) as safe as a hospital with the same death rate but treating 80 elderly patients with complex problems and 20 with knee arthroscopies?

Risk adjustment

- Since the 1980's similar risk adjustment methods have been employed in mortality studies
- Numerical models are produced that quantify the extent to which patient characteristics, present at admission, influence the likelihood of an outcome of interest.

Risk adjustment

- Logistic regression is used to generate weights related to factors that influence mortality, to then apply to each patient treated by a hospital.
- Those weights are used to create the expected number of patients that would have died if the hospital was performing at the average rate for the group of hospitals studied.

Risk adjustment

- The average mortality for a group of hospitals is 3 per hundred
- Hospital X treats three thousand patients. If it was an average hospital, it would expect to record 30 deaths per year.
- But if one hundred patients in that hospital are functionally equal to 500 patients treated in other hospitals, adjustments have to be made

Risk adjustment

- After adjustment, the ratio of the observed to the expected number of deaths is then calculated. Multiply X 100 to get the HSMR (Hospital Standardised Mortality Ratio)

If hospital X was like all the other large private hospitals in Australia, given it's casemix, it would expect 200 deaths per year. It actually recorded 300 deaths

300/200 X 100= HSMR 150

Risk adjustment

- Factors that influence mortality are identified within hospital morbidity returns- they include age, sex, primary and secondary diagnoses, mode of admission, and transfer status.
- Because of the sheer number of diagnoses, they have to be grouped in some way, and the now standard method used across the world is to group patients according to the Charlson Index.

Risk adjustment

- Clinical measures and laboratory results are not included within morbidity data sets, and that is likely to be the case into the foreseeable future.
- However, there is increasing acceptance that the addition of those measures would not increase the discriminatory power of risk adjustment to any measurable degree

Risk adjustment

- The most comprehensive studies in this area are by Iezzoni and Aylin et al

‘Severity [however measured] does not explain differences in death rates across hospitals’

Iezzoni, JAMA 1997 278:1600-7

Australian Private Hospitals

- The Clinical Epidemiology Unit at the Flinders Medical Centre undertook an analysis of the Hospital Casemix Protocol Data (HCP) generated by Australian Private Hospitals.
- The data was provided by the AHIA in de-identified form, and covered the financial years 2003/4 to 2005/6
- Is this data a suitable resource for assessing the safety and quality of Australian Private Hospitals?

Australian Private Hospitals

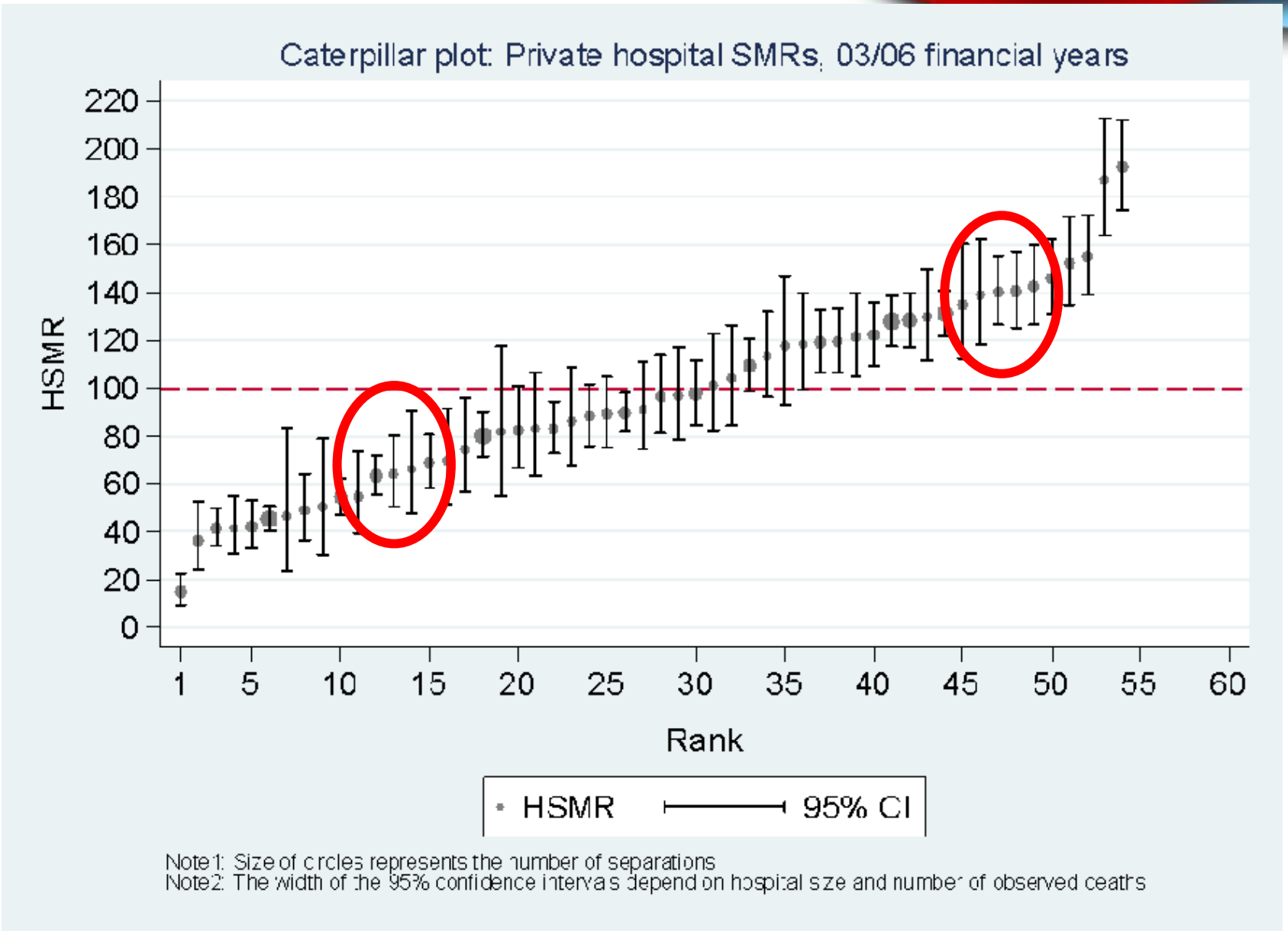
- We excluded small hospitals from study.
- We excluded all cases identified as being neonates, or palliative or rehabilitation care types
- We identified predictors of mortality risk (and other outcomes) from within the variables included in the HCP by means of logistic regression, and applied those to each hospitals activity

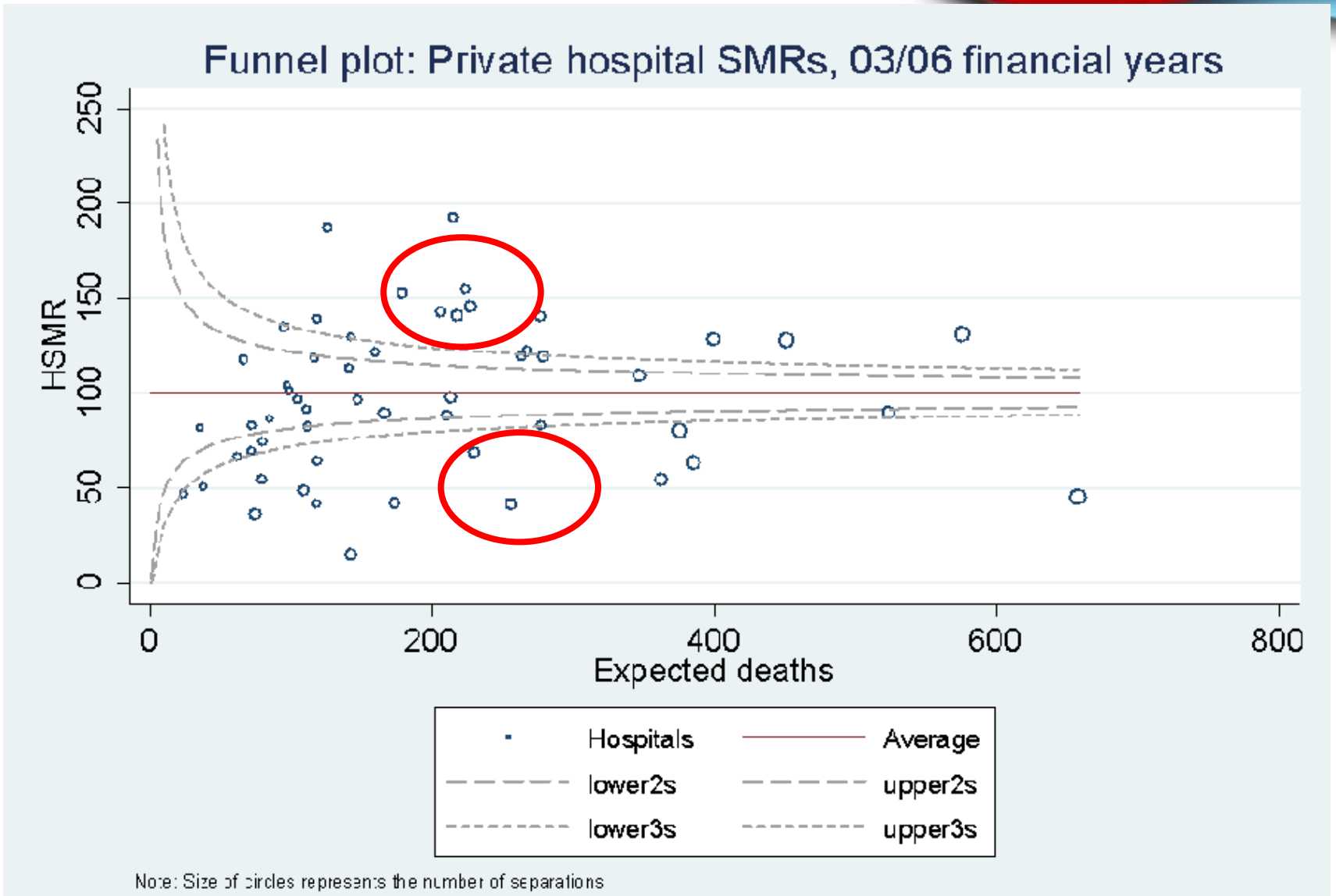
Australian Private Hospitals

- We found that outcomes at the hospital level to be quite stable over the three year period
- Similar results have been obtained from national studies in Holland and Canada
- There are consistent differences between hospitals that cannot be explained by severity alone, and for which chance is not a sufficient explanation

Australian Private Hospitals

- How should those differences be displayed
- Simple league tables of HSMRs?
- Catepillar plots?
- Funnel plots?
- A mixture?


Caterpillar plot: Private hospital SMRs, 03/06 financial years
HSMR
220
200
180
160
140
120
100
80
60
40
20
0
1
5
10
15
20
25
30
35
40
45
50
55
60
Rank
HSMR
95% CI
Note1: Size of circles represents the number of separations
Note2: The width of the 95% confidence intervals depend on hospital size and number of observed deaths


Funnel plot: Private hospital SMRs, 03/06 financial years
HSMR
0
50
100
150
200
250
0
200
400
600
800
Expected deaths
Hospitals
Average
lower2s
upper2s
lower3s
upper3s
Note: Size of circles represents the number of separations

Overall Mortality for Three Year Period						
Separations (N)	Observed Mortality (N)	Expected Mortality (N)	Standard. Morta-lity Ratio (%)	grp 03/04	grp-04/05	grp-05/06
12403	49	118	42	A+	A+	A+
20591	53	108	49	A+	A+	A+
30917	197	362	54	A+	A+	A+
25416	106	256	41	A+	A+	A+
23729	21	142	15	A+	A+	A+
48416	298	657	45	A+	A+	A+
34834	244	385	63	A+	A+	A+
25147	27	74	36	A+	A+	A+
23270	73	173	42	A+	A+	A+

Table 1: In-Hospital Mortality

Grouping*	Hospital	*Overall Mortality for Three Year Period* Separations (N)	Observed Mortality (N)	Expected Mortality (N)	Standard. Morta-lity Ratio (%)	grp 03/04	grp-04/05	grp-05/06
A+	A1056756	12403	49	118	42	A+	A+	A+
	PC780845	20591	53	108	49	A+	A+	A+
	QC251361	30917	197	362	54	A+	A+	A+
	QC378774	25416	106	256	41	A+	A+	A+
	RB392361	23729	21	142	15	A+	A+	A+
	UA746604	48416	298	657	45	A+	A+	A+
	UC123985	34834	244	385	63	A+	A+	A+
	UC652456	25147	27	74	36	A+	A+	A+
	UC988842	23270	73	173	42	A+	A+	A+
A	PA666177	12291	19	38	51	B	B	A
	PB294309	16707	43	79	55	B	A+	A+
	PC618051	48461	301	375	80	B	A	A+
	SC561484	20239	158	229	69	A+	B	A
	VB662847	16860	76	119	64	B	A+	A+
	C1097759	13121	101	105	97	B	B	B
	PC759512	14462	138	117	118	B	B	B
	QA512132	22838	332	278	119	C	B	B
	QA965983	11355	29	35	82	B	B	B
	QB102405	32066	469	523	90	B	A	B
	QB251559	13595	60	72	83	B	B	B
	QB459998	13640	159	141	113	B	B	B
	QC738283	14182	59	79	74	B	A	B
	RA377545	14299	101	111	91	B	B	B
	SA487742	15751	128	95	135	C-	B	B
	SA928207	13264	41	62	66	B	B	A+

Continued Table 1: In-Hospital Mortality

Grouping*	Hospital	*Overall Mortality for Three Year Period* Separations (N)	Observed Mortality (N)	Expected Mortality (N)	Standard. Mortality Ratio (%)	grp 03/04	grp-04/05	grp-05/06
C	A1007262	11990	165	119	139	C	B	C
	PB712572	22698	294	206	143	C	C-	C
	PC340205	24338	306	217	141	C	C-	C
	RB991002	47678	576	451	128	C-	C	C
	VC494628	31246	512	399	128	C	B	C-
C-	B1076635	49414	755	575	131	C-	C-	C
	PA483921	18832	388	276	140	C	C-	C
	PB356664	19512	346	223	155	C-	C-	C
	QB457035	20441	273	179	152	C-	C	C-
	TB215209	14457	235	126	187	C-	C-	B
	VC777295	23411	331	227	146	C	C-	C-
	WB893547	17371	414	215	193	C-	C-	C-

* The grouping is based on Average Yearly Mortality Score for three year period

Continued Table 1.1: MRSA

Grouping*	Hospital	*Overall MRSA Infections for Three Year Period*						
		Separations (N)	Observed Infections (N)	Expected Infections (N)	Standardised Ratio (%)	grp 03/04	grp-04/05	grp-05/06
B	TB184869	13352	18	17	107	A+	B	C
	UC123985	34834	78	76	103	A+	B	C
	UC988842	23270	8	13	61	A+	B	B
	VA405220	22641	22	24	91	A+	B	B
	VA533866	11332	7	16	45	B	B	B
	VA859674	32938	81	58	139	A+	C	C-
	VC363301	18429	12	22	54	A+	B	A
	WB893547	17371	25	33	75	A+	B	A
C-	QB251559	13595	67	18	368	B	C-	C-
	QC378774	25416	211	47	447	C-	C-	C-
	SA487742	15751	74	26	285	A	C-	C-
	UA746604	48416	602	114	529	C-	C-	C-

* The grouping is based on Average Yearly Mortality Score for three year period

Table 2: Indicator Outcomes for Total Period July 2003 - June 2006

Grouping based on Average Yearly Mortality Score for 3 year period	Hospital	Mortality			Multi-Resistant Methicillin Resistant Staphylococcus Aureus (MRSA)			Drugs, Medicaments and Biological Substances Causing Adverse Effects in Therapeutic Use			Misadventures to Patients during Surgical and Medical Care		
		Observed Deaths (N)	Expected Deaths (N)	*SR (%)	Observed Infections (N)	Expected Infections (N)	*SR (%)	Observed Events (N)	Expected Events (N)	*SR (%)	Observed Events (N)	Expected Events (N)	*SR (%)
A+	A1056756	49	118	41.5 *(31 - 55)*	8	21	37.6 *(16 - 74)*	162	210	77.2 *(66 -90)*	25	26	95.6 *(62 - 141)*
	PC780845	53	108	48.9 *(37 - 64)*	39	26	152.2 *(108 - 208)*	211	211	99.9 *(87 - 114)*	57	65	87.4 *(66 - 113)*
	QC251361	197	362	54.4 *(47 - 63)*	7	26	26.8 *(11 - 55)*	660	561	117.7 *(109 - 127)*	98	74	132.3 *(107 - 161)*
	QC378774	106	256	41.5 *(34 - 50)*	211	47	446.6 *(388 - 511)*	677	378	179.3 *(166 - 193)*	119	69	172.5 *(143 - 206)*
	RB392361	21	142	14.8 *(9 - 23)*	20	35	56.4 *(34 - 87)*	180	291	62 *(53 - 72)*	21	71	29.6 *(18 - 45)*
	UA746604	298	657	45.3 *(40 - 51)*	602	114	528.9 *(487 - 573)*	2268	1001	226.5 *(217 - 236)*	237	130	182.3 *(160 - 207)*
	UC123985	244	385	63.4 *(56 - 72)*	78	76	103.2 *(82 - 129)*		598	*(0 - 1+)*		91	*(0 - 4+)*
	UC652456	27	74	36.3 *(24 - 53)*	5	16	32.3 *(10 - 75)*	89	225	39.6 *(32 - 49)*	15	60	25.2 *(14 - 42)*
	UC988842	73	173	42.1 *(33 - 53)*	8	13	60.9 *(26 - 120)*	186	295	63.1 *(54 - 73)*	74	63	117.3 *(92 - 147)*
A	PA666177	19	38	50.5 *(30 - 79)*	1	13	7.9 *(0 - 44)*	30	112	26.8 *(18 - 38)*	22	30	73 *(46 - 111)*
	PB294309	43	79	54.6 *(39 - 74)*	2	11	18.6 *(2 - 67)*	218	171	127.6 *(111 - 146)*	38	38	98.8 *(70 - 136)*
	PC618051	301	375	80.2 *(71 - 90)*	67	77	87.5 *(68 - 111)*	1	670	0.1 *(0 - 1)*		134	*(0 - 3+)*
	SC561484	158	229	68.9 *(59 - 81)*	10	25	40.4 *(19 - 74)*	339	380	89.2 *(80 - 99)*	40	53	76.2 *(54 - 104)*
	VB662847	76	119	64 *(50 - 80)*	9	25	35.8 *(16 - 68)*	196	187	104.9 *(91 - 121)*	63	63	99.8 *(77 - 128)*

Conclusions

- There are real, substantial and stable differences between private hospitals in relation to outcomes of interest
- Existing data is suitable for demonstrating those differences

How should the data be used

- By institutions, as a screening tool to point towards a potential problem that requires further investigation and remedial action.
- Do such differences interest consumers-possibly
- Do such differences interest institutions – definitely
- Do they act as a spur to systematic improvements-probably

Should they interest insurers

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