

Data Analysis: Total S

- definition of variances
- results from analyte report compared to IA and Horwitz
- comparing methods

Informed use of statistical methods
requires an understanding of the
underlying reasoning

Introduction to the Practice of Statistics,
D.S. Moore and G.P. McCabe, 1996

DEFINITIONS ARE CRITICAL FOR
EFFECTIVE COMMUNICATION

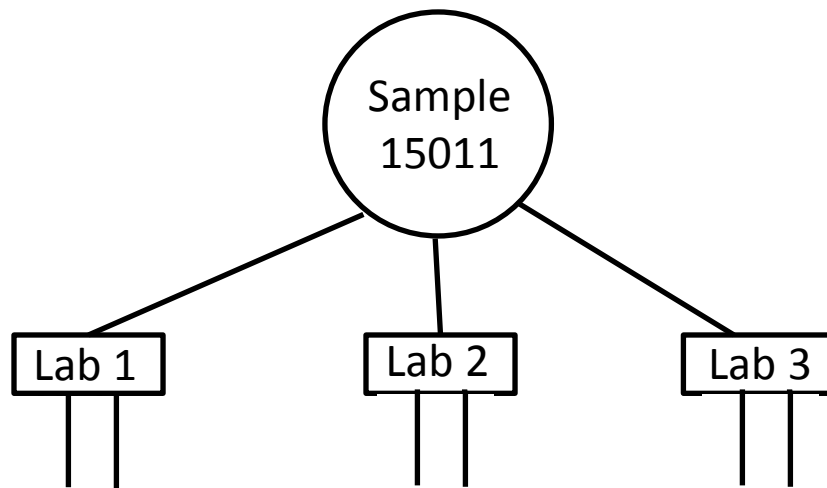
$$S_{\text{total}}^2 = S_{\text{part 1}}^2 + S_{\text{part b}}^2 + S_{\text{part c}}^2 + S_{\text{part d}}^2 + \dots$$

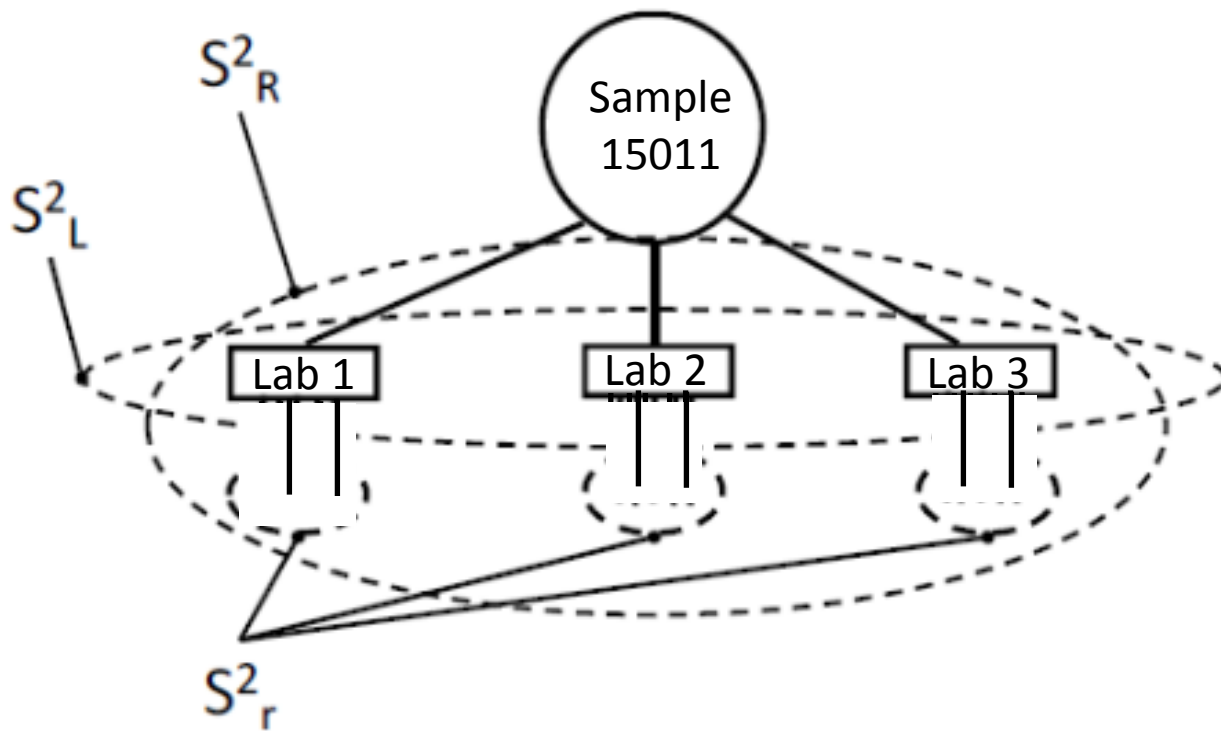
$$\text{Reproducibility } S_R^2 = S_L^2 + S_r^2$$

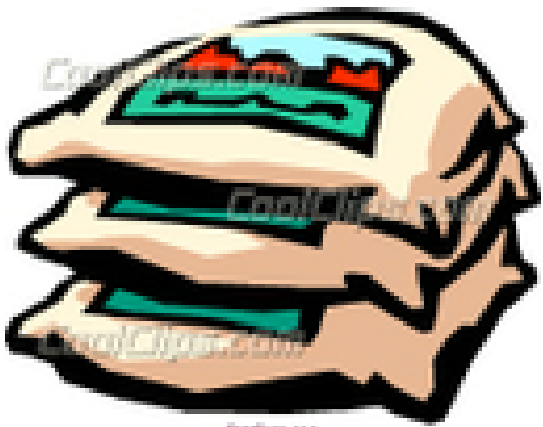
Between lab

Within lab

repeatability

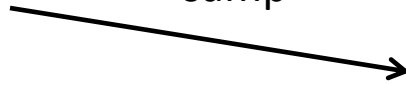




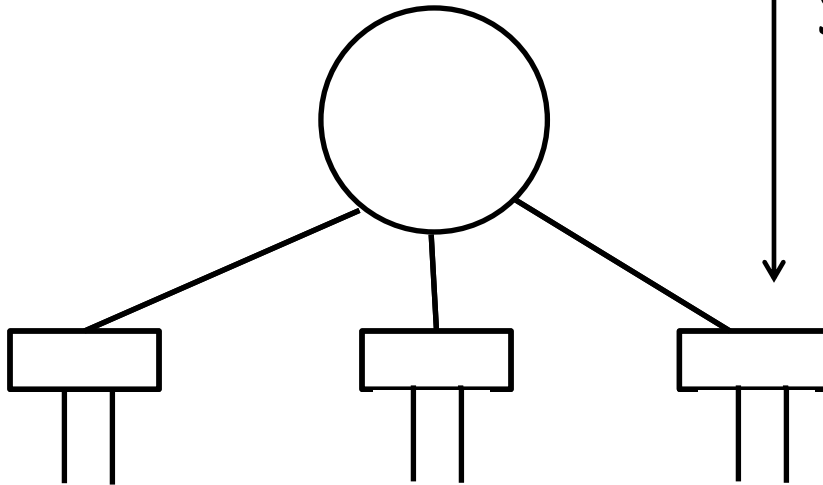


brothers.com

S_{samp}^2



S_{prep}^2



$$S_R = \sqrt{S_L^2 + S_r^2}$$

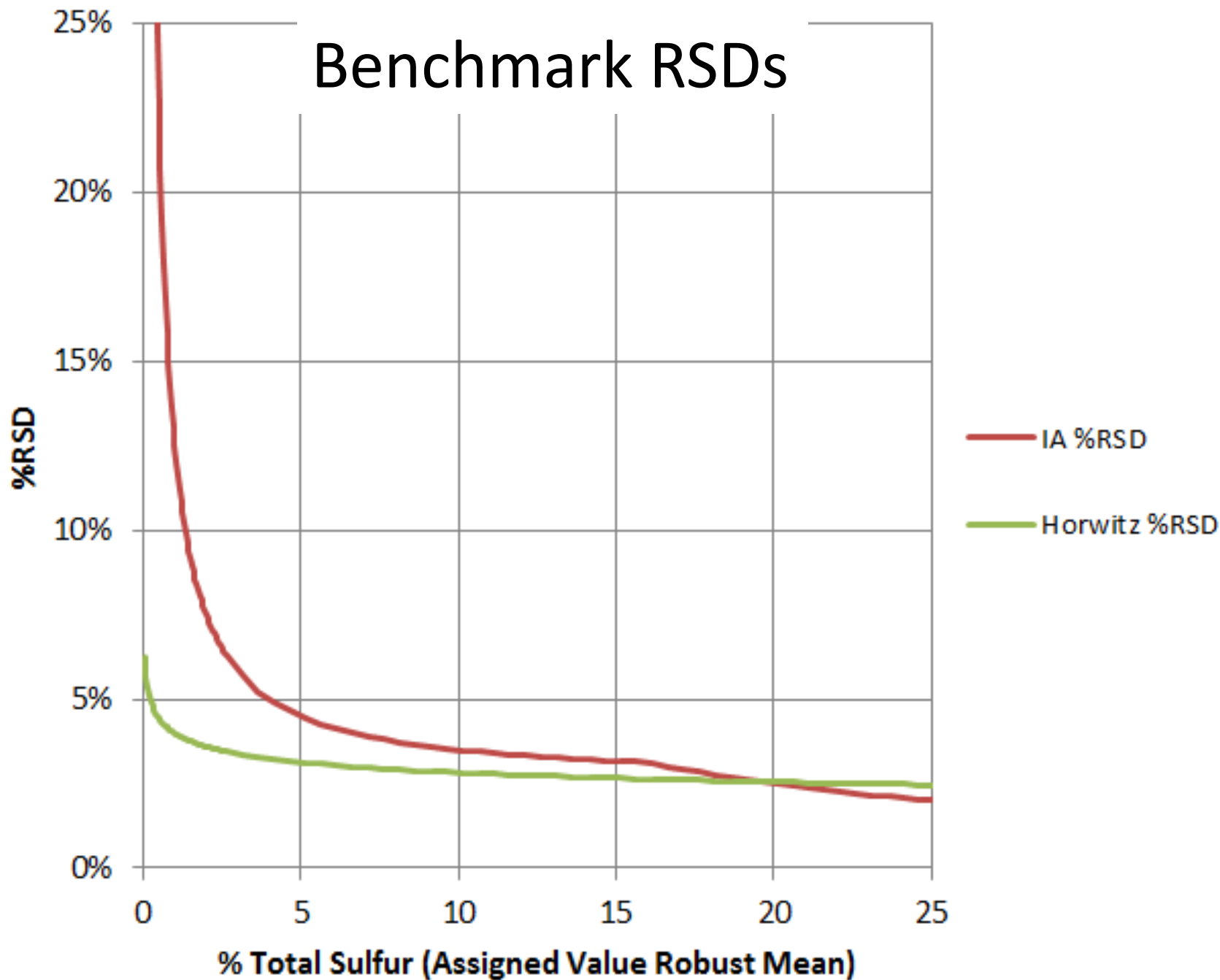
$$S_{IA} = \sqrt{S_L^2 + S_r^2 + S_{\text{prep}}^2 + S_{\text{samp}}^2}$$

$$\text{RSD}_R = \sqrt{\text{RSD}_L^2 + \text{RSD}_r^2}$$

$$\text{RSD}_{IA} = \sqrt{\text{RSD}_L^2 + \text{RSD}_r^2 + \text{RSD}_{\text{prep}}^2 + \text{RSD}_{\text{samp}}^2}$$

RSD_R compared to $\text{RSD}_{\text{Horowitz}} = 2 \times C^{-0.15}$

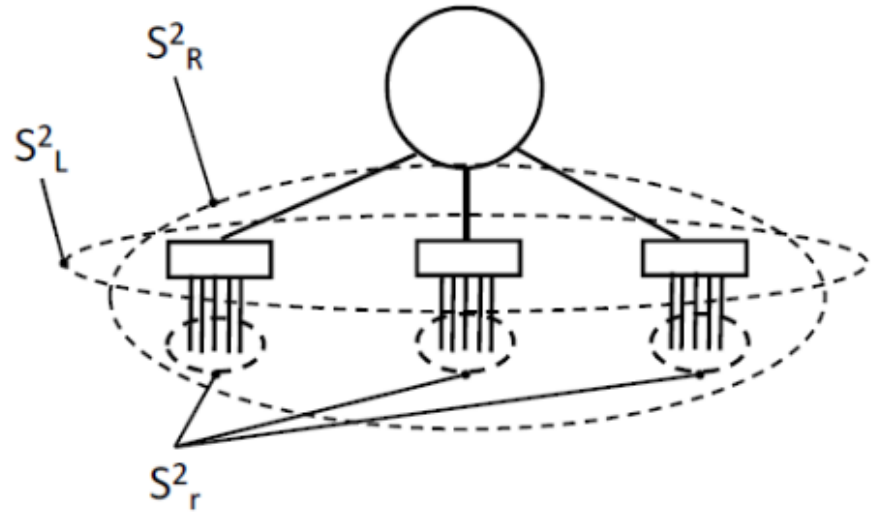
Benchmark RSDs

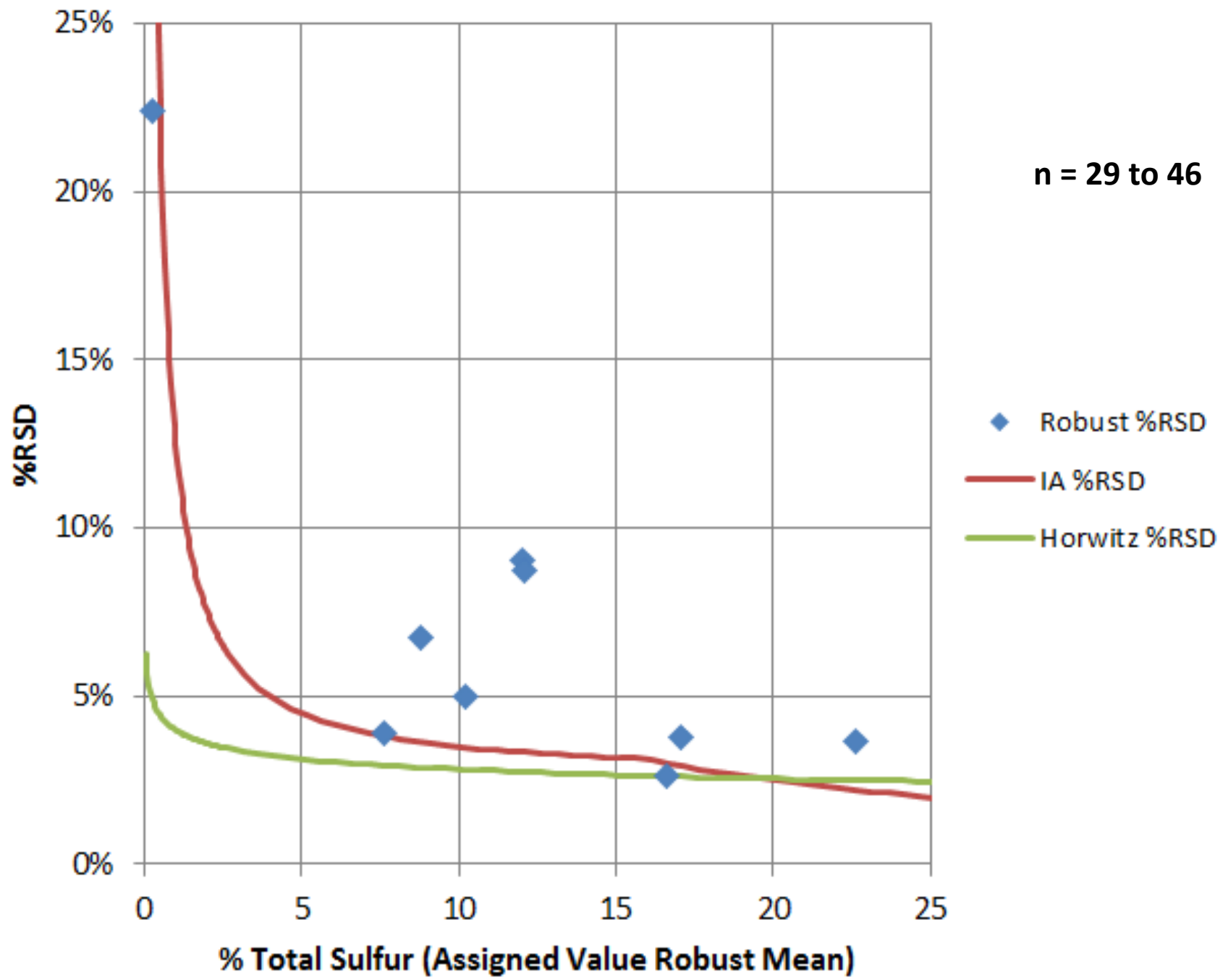


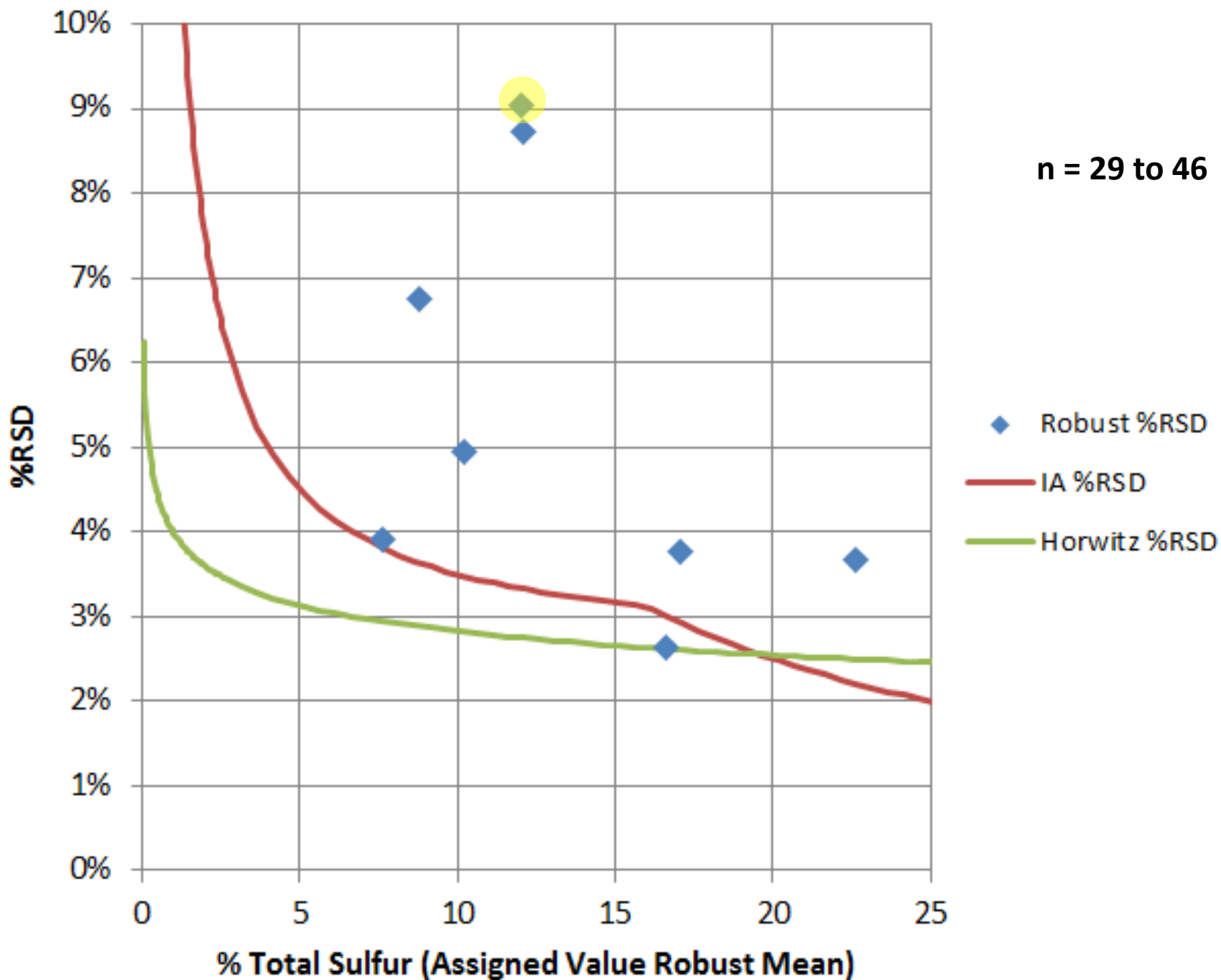
$$\text{RSD}_{\text{Horowitz}} = 2 \times C^{-0.15}$$

$$\text{RSD}_{\text{IA}} = \sqrt{\text{RSD}_{\text{L}}^2 + \text{RSD}_{\text{r}}^2 + \text{RSD}_{\text{prep}}^2 + \text{RSD}_{\text{samp}}^2}$$

$$\text{RSD}_{\text{Robust}} \approx \sqrt{\text{RSD}_{\text{L}}^2}$$







Magruder 160512 Micro Mix

Sulfur (S)* 9.0 %

Combined Sulfur (S)*9.0 %

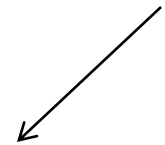
Analyte Group	Analyte (Units)	Lab Code	Lab Data		Method Values			# Tests	Magruder CS Z Score	Your Method	Flag
			Value	Range	Rob Mean	Rob SD	R-bar				
148	Total Sulfur (9%)	0519	9.130*	0.0600	12.10	1.055	0.2261	45	-2.81	148.07	0
148	Total Sulfur (9%)	0117	9.237*	0.0720	12.10	1.055	0.2261	45	-2.71	148.07	0
148	Total Sulfur (9%)	0354	9.721*	0.1640	12.10	1.055	0.2261	45	-2.25	148.99	0
148	Total Sulfur (9%)	0406	10.30*	0.5100	12.10	1.055	0.2261	45	-1.71	148.07	0
148	Total Sulfur (9%)	0486	10.31*	0.2900	12.10	1.055	0.2261	45	-1.70	148.07	0
148	Total Sulfur (9%)	0520	10.82*	0.3400	12.10	1.055	0.2261	45	-1.21	148.01	0
148	Total Sulfur (9%)	0444	10.97*	0.2300	12.10	1.055	0.2261	45	-1.07	148.01	0
148	Total Sulfur (9%)	0231	11.16*	0.0200	12.10	1.055	0.2261	45	-0.89	148.01	0
148	Total Sulfur (9%)	0482	11.20*	0.0000	12.10	1.055	0.2261	45	-0.85	148.99	0
148	Total Sulfur (9%)	0444	11.34	0.1800	12.10	1.055	0.2261	45	-0.72	148.07	0
148	Total Sulfur (9%)	0040	11.40	0.0000	12.10	1.055	0.2261	45	-0.66	148.01	0
148	Total Sulfur (9%)	0102	11.41	0.1230	12.10	1.055	0.2261	45	-0.65	148.01	0
148	Total Sulfur (9%)	0481	11.58	0.0300	12.10	1.055	0.2261	45	-0.49	148.01	0
148	Total Sulfur (9%)	0325	11.65	0.7000	12.10	1.055	0.2261	45	-0.42	148.07	0
148	Total Sulfur (9%)	0506	11.70	0.4000	12.10	1.055	0.2261	45	-0.37	148.99	0
148	Total Sulfur (9%)	0096	11.74	0.1800	12.10	1.055	0.2261	45	-0.34	148.99	0
148	Total Sulfur (9%)	0043	11.77	0.1000	12.10	1.055	0.2261	45	-0.31	148.01	0
148	Total Sulfur (9%)	0485	11.80	0.1700	12.10	1.055	0.2261	45	-0.28	148.01	0
148	Total Sulfur (9%)	0422	11.92	0.3700	12.10	1.055	0.2261	45	-0.17	148.07	0
148	Total Sulfur (9%)	0105	12.04	0.3000	12.10	1.055	0.2261	45	-0.05	148.01	0
148	Total Sulfur (9%)	0095	12.09	0.0400	12.10	1.055	0.2261	45	-0.01	148.01	0
148	Total Sulfur (9%)	0291	12.11	0.0800	12.10	1.055	0.2261	45	0.01	148.99	0
148	Total Sulfur (9%)	0157	12.25	0.1000	12.10	1.055	0.2261	45	0.15	148.01	0
148	Total Sulfur (9%)	0029	12.29	0.0300	12.10	1.055	0.2261	45	0.18	148.01	0
148	Total Sulfur (9%)	0292	12.30	0.0300	12.10	1.055	0.2261	45	0.19	148.07	0
148	Total Sulfur (9%)	0360	12.31	0.6400	12.10	1.055	0.2261	45	0.20	148.00	0
148	Total Sulfur (9%)	0073	12.33	0.5700	12.10	1.055	0.2261	45	0.22	148.01	0
148	Total Sulfur (9%)	0157	12.35	0.3000	12.10	1.055	0.2261	45	0.24	148.00	0
148	Total Sulfur (9%)	0023	12.38	0.6180	12.10	1.055	0.2261	45	0.27	148.07	0
148	Total Sulfur (9%)	0114	12.45	0.2000	12.10	1.055	0.2261	45	0.34	148.01	0
148	Total Sulfur (9%)	0102	12.48	0.0060	12.10	1.055	0.2261	45	0.37	148.07	0
148	Total Sulfur (9%)	0230	12.50	0.2000	12.10	1.055	0.2261	45	0.38	148.01	0
148	Total Sulfur (9%)	0025	12.57	0.1000	12.10	1.055	0.2261	45	0.45	148.00	0

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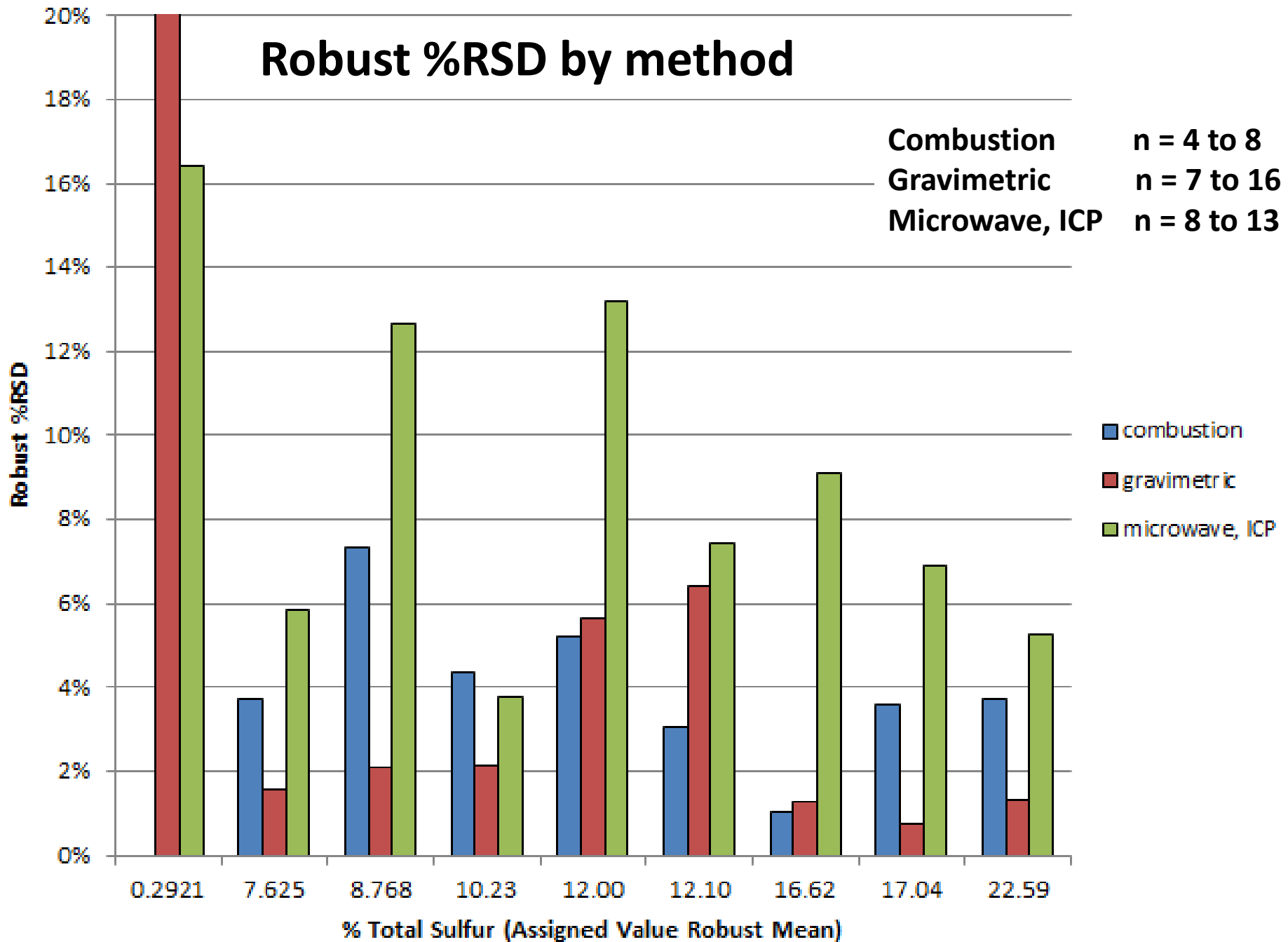
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148	Total Sulfur (9%)	0482	11.20*	0.0000	12.10	1.055	0.2261	45	-0.85	148.99	0



148.01 gravimetric
 148.07 microwave – ICP
 148.99 other

Robust %RSD by method

Combustion n = 4 to 8
Gravimetric n = 7 to 16
Microwave, ICP n = 8 to 13



Within Labs %rsd by method

