Module 5 Wrap Up: Non-Parametric Tests

Odds Ratio, RR, GWAS

Agenda:

- Odds ratio
- Relative Risk
- Genome-Wide Association Studies

Odds Ratio:

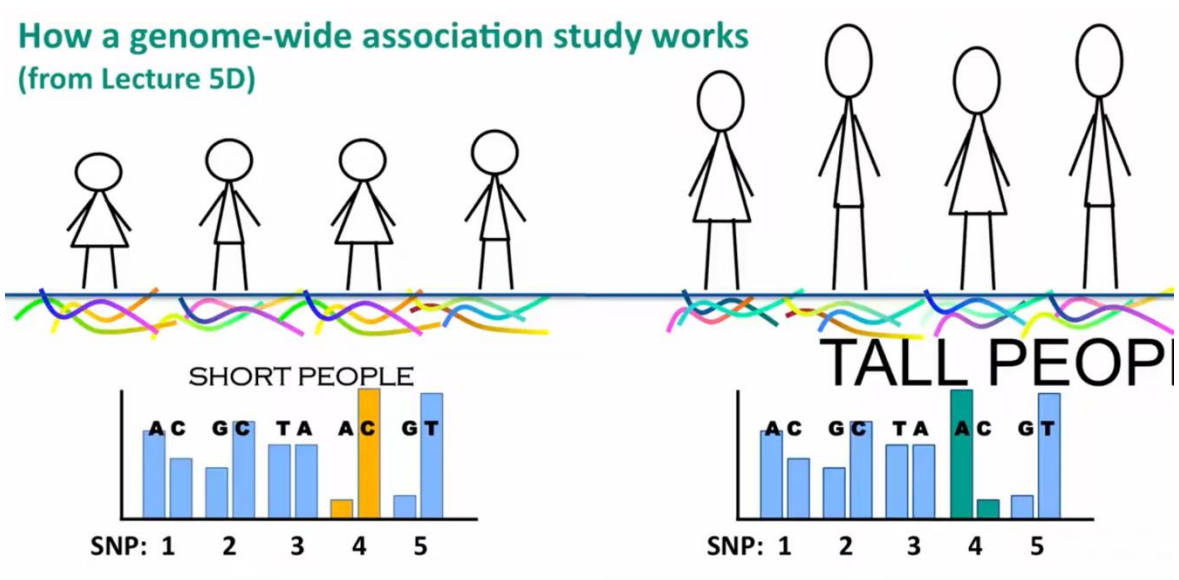
The odds of success in one group divided by the odds of success in another group

- *usually asking "Does the treatment/intervention" change the outcome (compared to control)?*

$$\widehat{OR} = \frac{\widehat{O_1}}{\hat{O}_2} = \frac{a/c}{b/d} = \frac{ad}{bc}$$

	Treatment	Control
Success	a	b
Failure	c	d

$$\text{OR} = \frac{\frac{P(Y=1|X=1)}{1-P(Y=1|X=1)}}{\frac{P(Y=1|X=0)}{1-P(Y=1|X=0)}}$$



YouTube series by Rosie Redfield called “Useful Genetics”

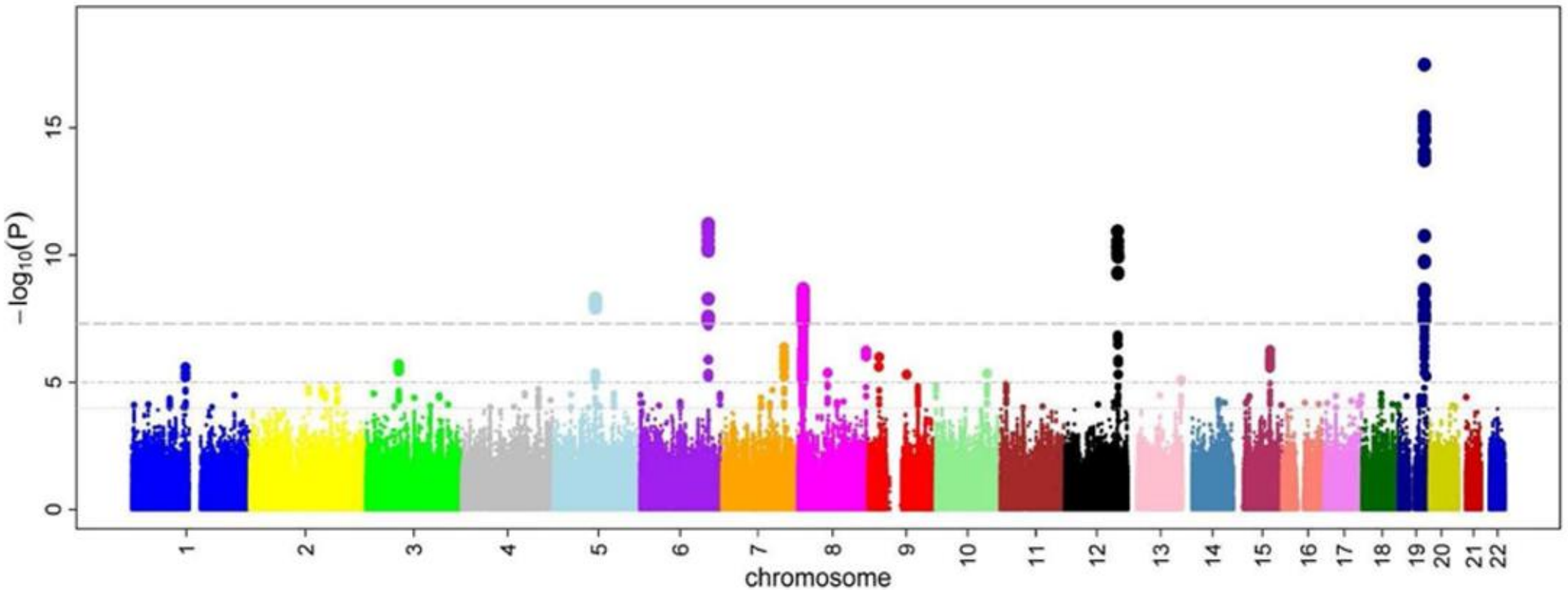
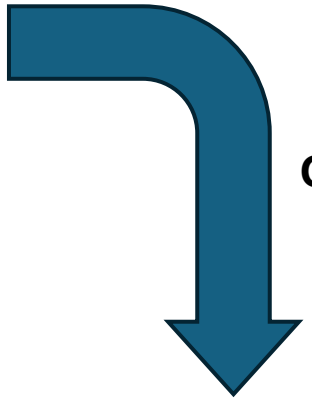


Image from Wikipedia: M. Kamran Ikram et al - Ikram MK et al (2010)

SNP	Risk Allele	Cases with Allele	Cases without	Controls with Allele	Controls without
rs101	A	40	60	20	80
rs202	G	70	30	50	50
rs303	T	25	75	25	75
rs404	C	10	90	20	80



OR=(a/b)/(c/d)=(ad)/(bc)

SNP	Cases (a,b)	Controls (c,d)	OR	Interpretation
rs101	40, 60	20, 80	(40×80)/(60×20)=**2.67**	Risk allele A roughly doubles odds of disease
rs202	70, 30	50, 50	(70×50)/(30×50)=**2.33**	G allele modestly increases disease risk
rs303	25, 75	25, 75	(25×75)/(75×25)=**1.00**	No association, frequencies equal
rs404	10, 90	20, 80	(10×80)/(90×20)=**0.44**	C allele may be protective (less common in cases)

You could compute 95% Confidence Interval.....

As always: correlation ≠ causation

Module 5 Wrap Up: A Parametric Test

Z-scores & RNAseq analysis

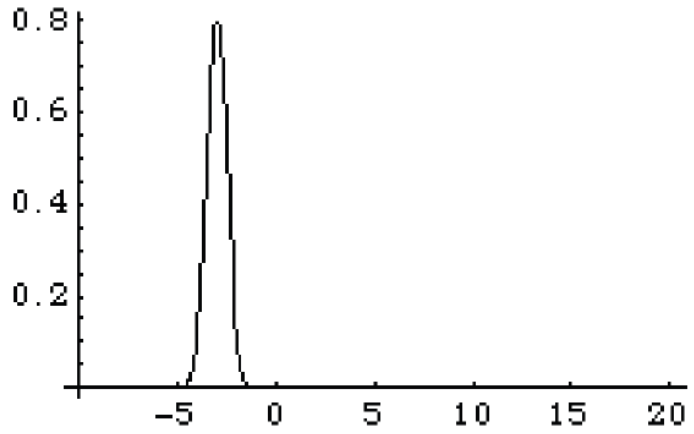
Agenda:

1. Z-scores
2. RNASeq

By M. Kamran Ikram et al - Ikram MK et al (2010) Four Novel Loci (19q13, 6q24, 12q24, and 5q14) Influence the Micr

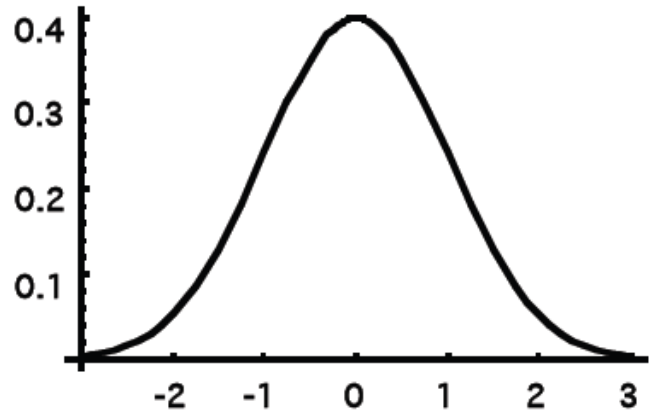
The Standard Normal Distribution:

- Mean is zero ($\mu = 0$)
- Standard deviation is 1 ($\sigma = 1$)

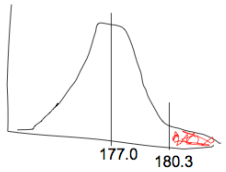


$\mu = -3$; $\sigma = 1/2$

$$Z = \frac{X_i - \mu}{\sigma} \quad \& \quad Z = \frac{\bar{Y} - \mu}{\sigma_{\bar{Y}}}$$



Example: British Spies. MI5 says that a man must be shorter than 180.3 cm tall to be a spy. The mean height of British men is 177.0 cm, with standard deviation 7.1 cm, and with a normal distribution. ***What proportion of British men are excluded from a career as a spy by this height criteria?***



Step 1: Draw out question.

Step 2: Transform into Standard Normal

Step 3: Look up probability online

https://www.z-table.com/

$$\mu = 177.0cm$$
$$\sigma = 7.1cm$$
$$X = 180.3cm$$
$$P[height > 180.3]$$

$$Z = \frac{X - \mu}{\sigma}$$
$$Z = \frac{180.3 - 177.0}{7.1}$$
$$Z = 0.46$$

	x.x0	x.x1	x.x2	.x3	x.x4	x.x5	x.x6	x.x7	x.x8	x.x9
0.0	0.5	0.49601	0.49202	0.48803	0.48405	0.48006	0.47608	0.47210	0.46812	0.46414
0.1	0.46017	0.45620	0.45224	0.44828	0.44433	0.44038	0.43644	0.43251	0.42858	0.42465
0.2	0.42074	0.41683	0.41294	0.40905	0.40517	0.40129	0.39743	0.39358	0.38974	0.38591
0.3	0.38209	0.37828	0.37448	0.37070	0.36693	0.36317	0.35942	0.35569	0.35197	0.34827
0.4	0.34458	0.34090	0.33724	0.33360	0.32997	0.32636	0.32276	0.31918	0.31561	0.31207
0.5	0.30854	0.30503	0.30153	0.29806	0.29460	0.29116	0.28774	0.28434	0.28096	0.27760
0.6	0.27425	0.27093	0.26763	0.26435	0.26109	0.25785	0.25463	0.25143	0.24825	0.24510
0.7	0.24196	0.23885	0.23576	0.23270	0.22965	0.22663	0.22363	0.22065	0.21770	0.21476