704SM Biostatistica

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ottobre 2016

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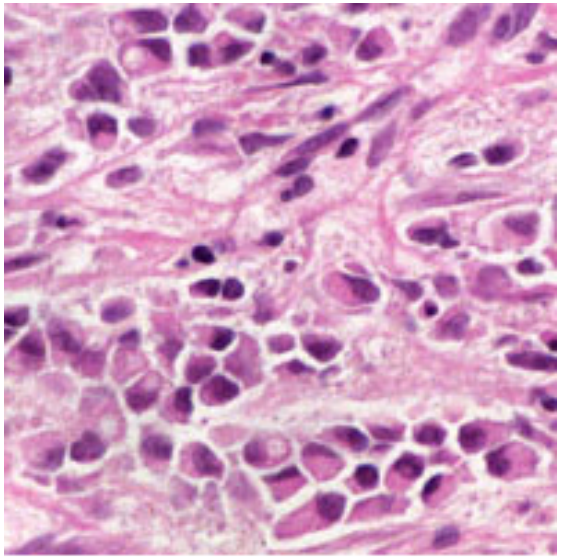
SOCIETA' DEI MATEMATICI
E NATURALISTI DI MODENA
www.socnatmatmo.unimore.it

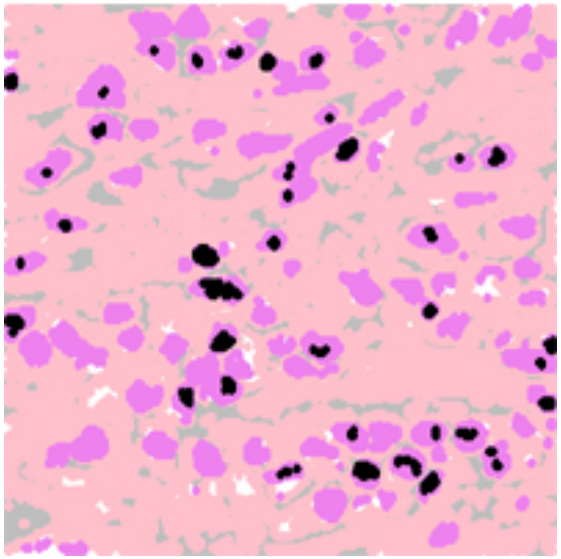
domande

- Quali sono le tipiche situazioni di laboratorio che vengono (*venivano?*) affrontate con i test statistici?
- Quali **metodi** si utilizzano?
- Quali sono i **limiti** da tenere a mente?

Differenze quantitative tra due gruppi

Differenze qualitative tra due gruppi





	A	B	C
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			

Differenze quantitative tra due gruppi

	A	B
1	misura	gruppo
2	67	marrone
3	56	marrone
4	68	marrone
5	43	marrone
6	32	grigio
7	54	grigio
8	65	grigio
9	45	grigio
10	34	grigio

Notate come è opportuno raccogliere i dati nel foglio elettronico

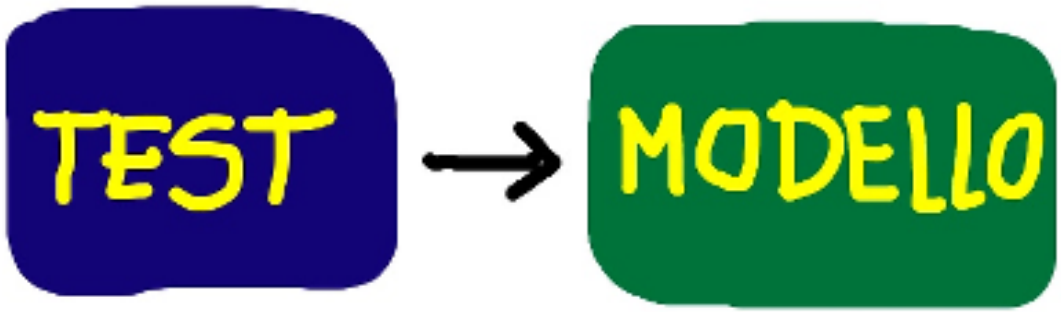
Differenze qualitative tra due gruppi

	A	B
1	esito	gruppo
2	vivo	marrone
3	vivo	marrone
4	vivo	marrone
5	deceduto	marrone
6	deceduto	grigio
7	vivo	grigio
8	deceduto	grigio
9	deceduto	grigio
10	deceduto	grigio

tipico negli studi di associazione

cosa succede se ..

- non ho una misura quantitativa su due ma su **tre** gruppi?
- ho due gruppi ma ho **due** misure qualitative da raffrontare all'interno dei gruppi?
- ho **quattro** gruppi con **una** misura quantitativa da raffrontare con altre **due** misure qualitative e **tre** misure quantitative
- ...



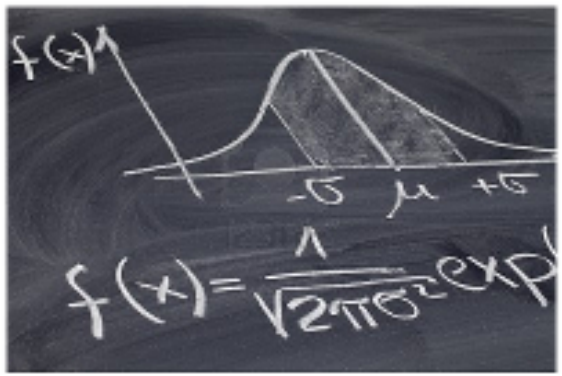
Cosa ci consentirà il modello statistico

identificatore	input	input	input	...	output
dato	dato	dato	dato	...	dato
dato	dato	dato	dato	...	dato
dato	dato	dato	dato	...	dato
dato	dato	dato	dato	...	dato
dato	dato	dato	dato	...	dato
dato	dato	dato	dato	...	dato
...	...	...	...	...	...

- risposta
- covariate o predittori?
- cross-section o repeated measures?

quali metodi utilizzano i test

- parametrici
- non parametrici
- esatti
- ricampionamento



domande

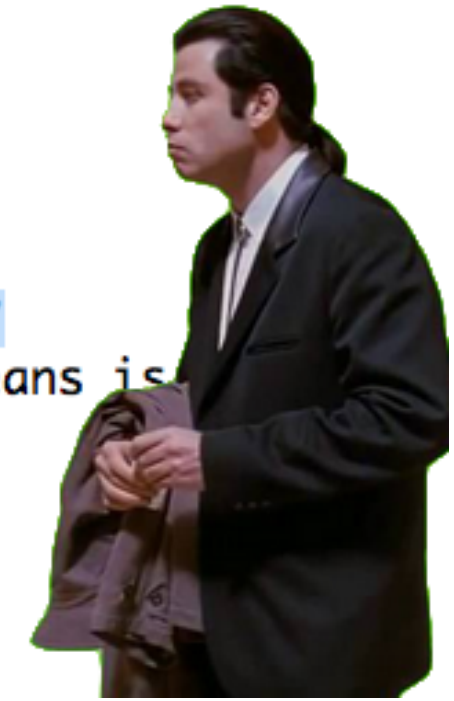
- Quali sono i 'caveat' da tenere a mente?

il p-value dipende da N

Cambiando la dimensione del campione, la decisione può cambiare

```
> t.test(FC[CODPAZ = 1:150] ~ SESSO[CODPAZ = 1:150])
t = -0.98468, df = 147.98, p-value = 0.3264
alternative hypothesis: true difference in means is not equal
95 percent confidence interval:
 -5.144861  1.722783
sample estimates:
mean in group 1 mean in group 2
       73.68182        75.39286
```

```
> t.test(FC ~ SESSO)
t = -5.0218, df = 1222.1, p-value = 5.878e-07
alternative hypothesis: true difference in means is
95 percent confidence interval:
 -4.809302 -2.107195
sample estimates:
mean in group 1 mean in group 2
       70.29897        73.75722
```



misconcetti sul p-value

- .. se $P = .32$ allora $P(H_0) = 0.68$ ..
- .. a statistically significant finding is clinically important ..

A Dirty Dozen: Twelve *P*-Value Misconceptions

Steven Goodman

The *P* value is a measure of statistical evidence that appears in virtually all medical research papers. Its interpretation is made extraordinarily difficult because it is not part of any formal system of statistical inference. As a result, the *P* value's inferential meaning is widely and often wildly misconstrued, a fact that has been pointed out in innumerable papers and books appearing since at least the 1940s. This commentary reviews a dozen of these common misinterpretations and explains why each is wrong. It also reviews the possible consequences of these improper understandings or representations of its meaning. Finally, it contrasts the *P* value with its Bayesian counterpart, the Bayes' factor, which has virtually all of the desirable properties of an evidential measure that the *P* value lacks, most notably interpretability. The most serious consequence of this array of *P*-value misconceptions is the false belief that the probability of a conclusion being in error can be calculated from the data in a single experiment without reference to external evidence or the plausibility of the underlying mechanism.
Semin Hematol 45:135-140

http://www.perfendo.org/docs/BayesProbability/twelvePvaluemisconceptions.pdf

$p < 0.05$

.. il livello α deve essere, sempre e comunque, 5% ..

D. Curran-Everett,
D. J. Benos

J Appl Physiol
97:457-459, 2004.

conclusions are justified.

Guideline 2. Define and justify a critical significance level α appropriate to the goals of your study. For any statistical test, if the achieved significance level P is less than the critical significance level α, defined before any data are collected, then the experimental effect is likely to be real (see Ref. 9, p. 782). By tradition, most researchers define α to be 0.05: that is, 5% of the time they are willing to declare an effect exists when it does not. These examples illustrate that $\alpha = 0.05$ is sometimes inappropriate.

If you plan a study in the hopes of finding an effect that could lead to a promising scientific discovery, then $\alpha = 0.10$ is appropriate. Why? When you define α to be 0.10, you increase the probability that you find the effect if it exists.

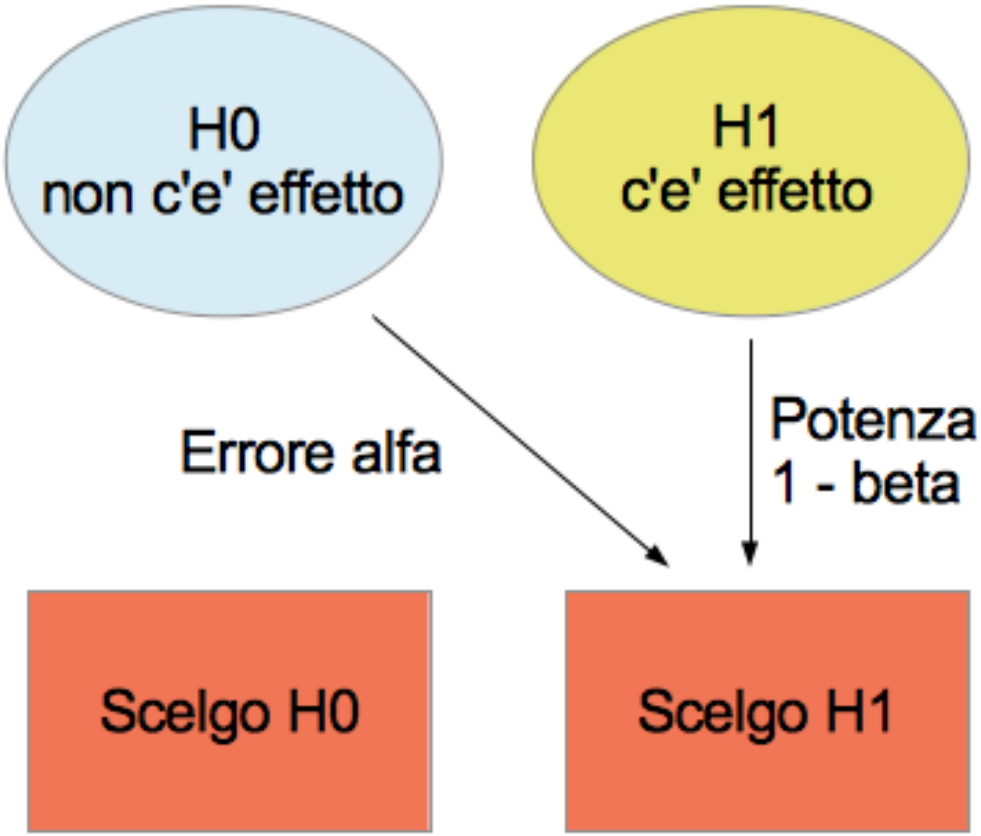
In contrast, if you want to be especially confident of a possible scientific discovery, then $\alpha = 0.01$ is appropriate: only 1% of the time are you willing to declare an effect exists when it does not.

A statistician can help you satisfy this guideline (see *Guide*

la potenza di un test

Quali errori può fare un giudice?

- condannare un innocente (errore α)
- assolvere un colpevole (errore β)



To infinity, and beyond!

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JULY 14, 2014

Why post-hoc power calculation is not helpful

https://dirnagl.com/2014/07/14/why-post-hoc-power-calculation-does-not-help/

la potenza $1 - \beta$ dipende da N

Cambiando la dimensione del campione la decisione può cambiare