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Styrke- og utvalgsberegning

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Sample size and Power calculations

The essential question in any trial/analysis:

”How many patients/persons/observations do I need?”

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Sample size (an example)

"Twenty patients (10 in Arm A and 10 in Arm B) will be included initially as a "run in phase" of the study for the initial evaluation of feasibility and safety… The median survival in patients who are given (…) is taken to be 6.5 months. To detect an increase of at least 3 months in survival among patients given (…) (ie. to 9.5 months), the trial would need to recruit 50 patients; this with 70% power and a level of significance of 5% (two-sided)

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Sample size and Power calculations

The essential question in any trial/analysis:

"How many patients/persons/observations do I need?"

a. Fikk vi svar på spørsmålet?
b. Er vi fornøyd med svaret?

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Sample size (an example)

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Expect three questions in return (I)

- *How frequent is the condition you are interested in?*
  - ✓ Which relates to your knowledge about the *incidence* and *prevalence* of the disease under study (or any other relevant outcome measure)

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Expect three questions in return (II)

- *What is the size of the difference you would like to observe?*
  - ✓ Which relates to the magnitude of the effect you aim to uncover, - from your *clinical* og *biological* point of view
  - ✓ In other words: What is the minimum difference that is of clinical importance (significance) *to you*?

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Expect three questions in return (III)

- *How sure do you want to be (ie. once you draw your conclusion)?*
  - ✓ That your observed difference is a ”true” one
  - ✓ That the difference you look for, is not overlooked

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Sample size (an example)

"Twenty patients (10 in Arm A and 10 in Arm B) will be included initially as a "run in phase" of the study for the initial evaluation of feasibility and safety… The median survival in patients who are given (…) is taken to be 6.5 months. To detect an increase of at least 3 months in survival among patients given (…) (ie. to 9.5 months), the trial would need to recruit 50 patients; this with 70% power and a level of significance of 5% (two-sided)

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I denne timen skal vi snakke om

- One sample test
- Two sample test

- One sided test
- Two sided test

- Continous variables
- Proportions

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To sitater det kan være verdt å merke seg:

- ”Hypotese er et utsagn hvis feilaktige benektelse en fortrinnsvis ønsker å unngå”

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- ”Hypotheses can only be tested, but never proven”

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Hypotesetestingen går ut på å ta stilling til:

Null-hypotesen i forhold til Alternativ-hypotesen

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$H_0: \mu = \mu_0$ vs. $H_1: \mu = \mu_1$

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Eks. Randomisert kontrollert forsøk

Dvs. En sammenligning av Beh. A vs Beh. B

$H_0: \mu_A = \mu_B$ vs. $H_1: \mu_A \neq \mu_B$

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Forutsatt at H_0 = Sann

		Vår konklusjon	
		Ja = Sann	Nei = Usann
"The ABSLOUTE Truth"	Ja = Sann	ok	Type I feil (α)
	Nei = Usann	Type II feil (β)	ok

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Signifikans (statistisk):

Sannsynligheten for å forkaste H_0 når H_0 er sann. Uttrykt som valg av α-nivå

(= ”Vår villighet til å begå en Type I feil”)

Styrke:

Studiens evne til å forkaste H_0 når H_0 er usann.Uttrykt som valg av β-nivå (eller egentlig 1 – β)

(= ”Vår villighet til å begå Type II feil”)

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Faktorer som påvirker styrken (1 – β)

- Ved å redusere signifikansnivået (*lavere* α), vil styrken gå *ned*
- Hvis $|\mu_1 - \mu_0|$ *økes*, vil styrken gå *opp*
- Hvis målet på spredning (SEM) *øker*, vil styrken *reduseres*
- Hvis studieutvalget (n) *økes*, vil styrken gå *opp*

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Faktorer som påvirker utvalgsstørrelse (n)

- Det kreves større utvalg jo større målet for spredning er
- Det kreves større utvalg jo strengere krav det stilles til α
- Det kreves større utvalg jo strengere krav det stilles til (1 – β)
- Det kreves mindre utvalg med økende absolutt differanse mellom verdien for H_0 og H_1 (dvs. μ_0 vs. μ_1)

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What you need to know and decide

1. *α* Level and $Z_{\alpha/2}$
2. *β* level and Z_{β}
3. *δ* level = difference (in prevalence, incidence, or any outcome variable) between the groups you want to observe

Then – and only then – can you calculate the number needed in your study (ie. *n* in each arm)