

Nytt (og gammelt):

”Geriorespiologiatri”

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Agenda

- Lungealdring
- Normal lungefunksjon hos eldre
- Normal gass utveksling hos eldre

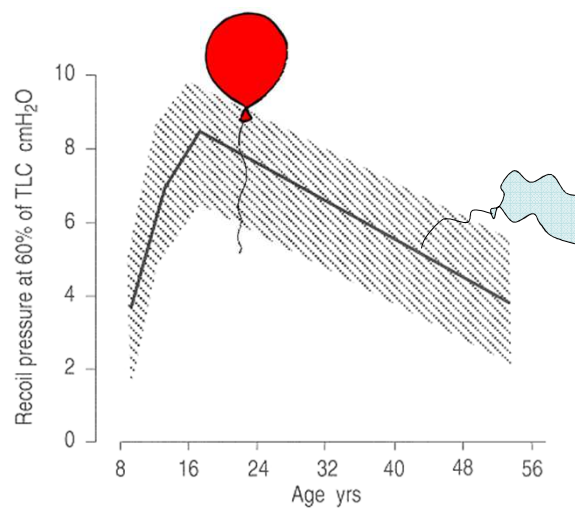
Respiratorisk Aldring

- Tap av vevselastitet
- Degenerative forandringer i toraksveggen
- Reduksjon av muskelstyrke?

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Lungevevs elastisitet



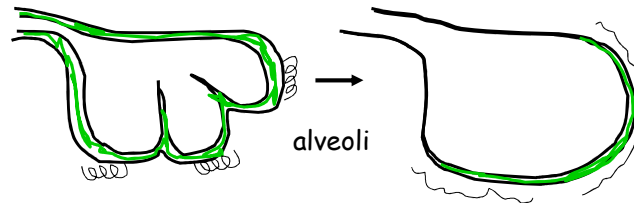
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Fig. 2. - Static elastic recoil as a function of age. Static elastic recoil was measured at 60% of total lung capacity (TLC). Shaded area shows ± 1 SD of plotted means. (Adapted from TURNER *et al.*, 1968 [27].)

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Lungevevs elastisitet ...

1. Forhindrer over-distensjon av alveoli



2. Forhindrer kollaps av terminale bronchioler



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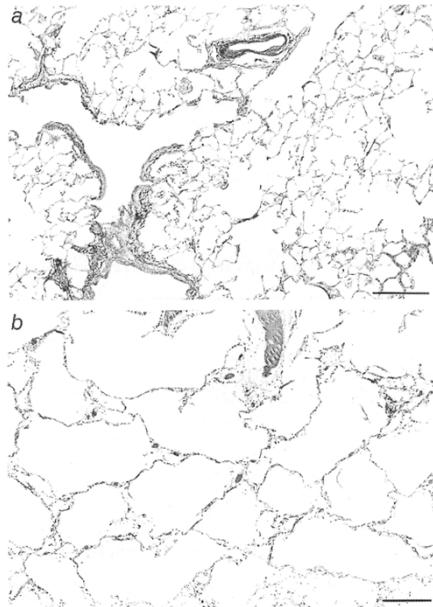
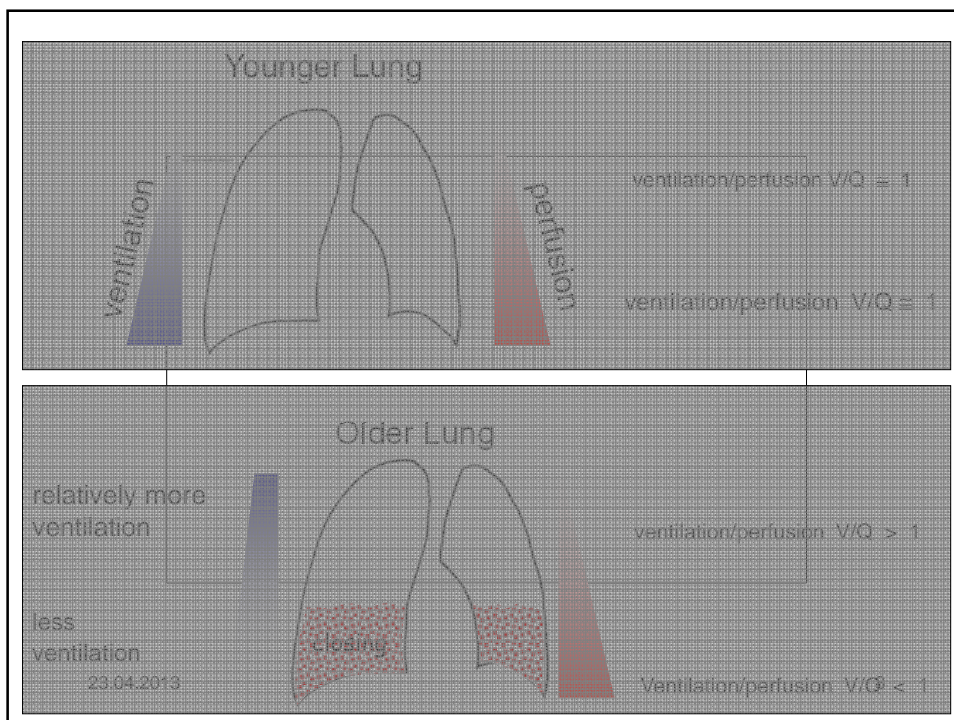
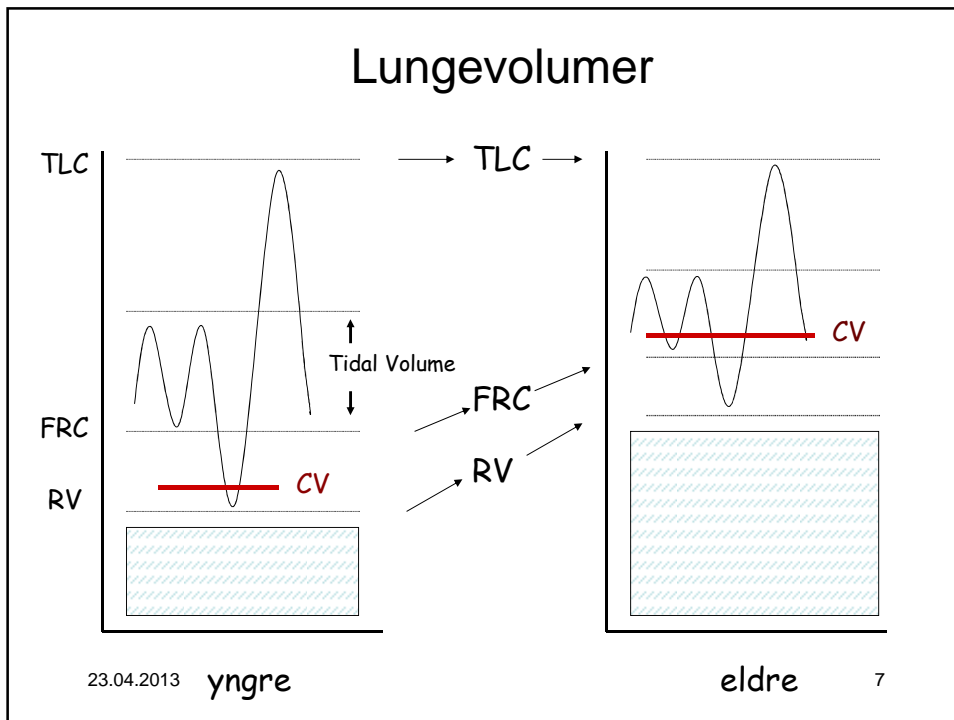


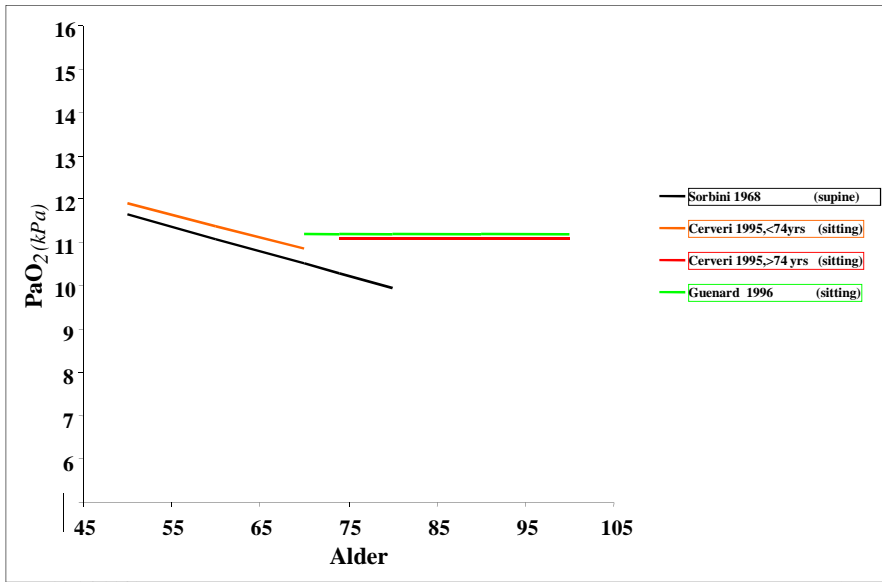
Fig. 4. - Lung parenchyma from a) a nonsmoking 29-yr-old subject and b) a 100-yr-old nonsmoking patient who died from pneumonia. Note marked enlargement of alveoli without any inflammatory infiltrate. (Hae-matoxylin and eosin stain; internal scale bar=280 μ m (a); 250 μ m (b).)

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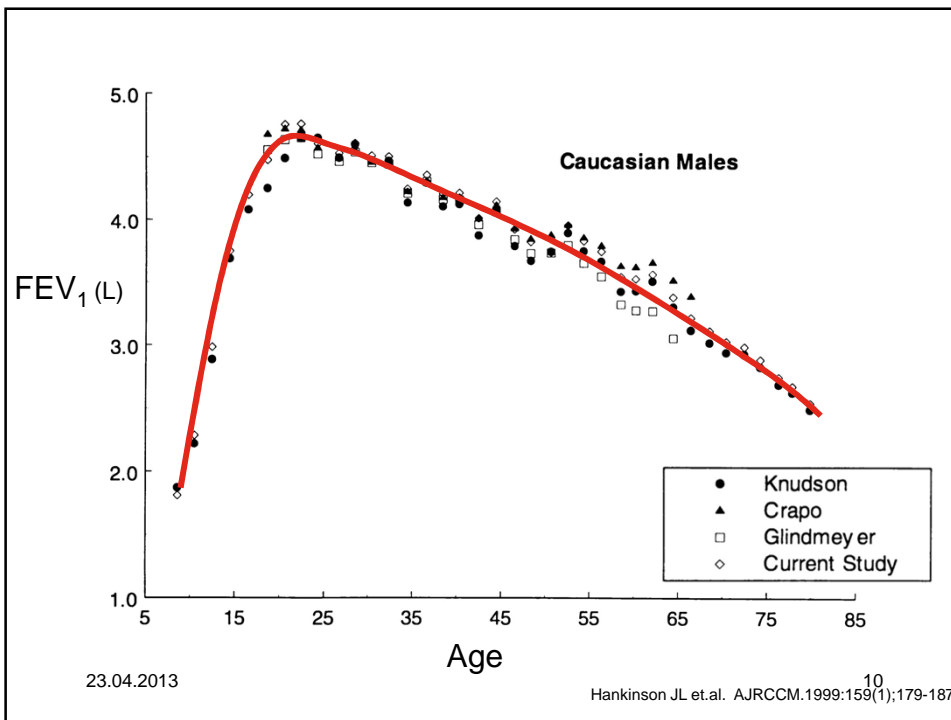


lavt PaO₂ hos eldre?



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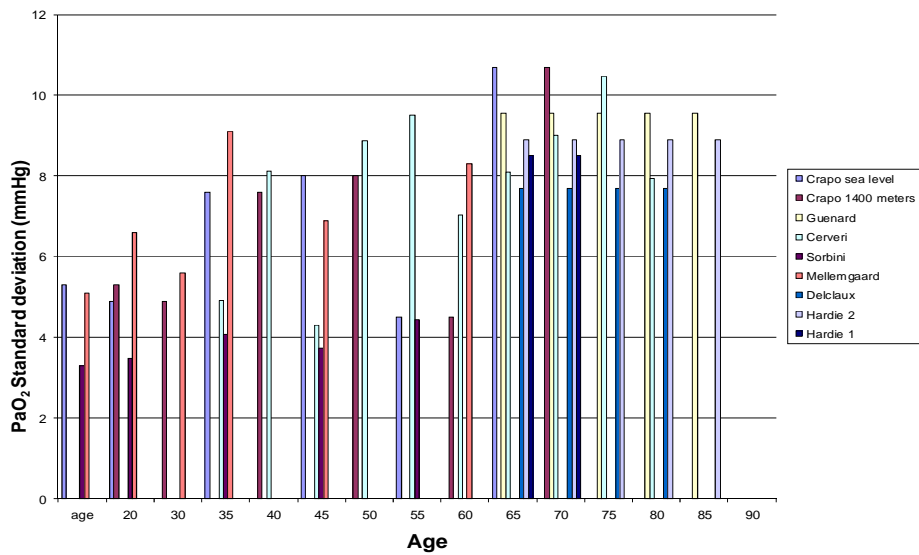
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Hankinson JL et al. AJRCCM.1999;159(1):179-187

Populasjonsvariabilitet for PaO2 etter Alder



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Elderly Lung Health Study

Referanseverdier:
Spirometri
Blodgasser

Methods: Sample

Phase I:

- Population Sample
- Bergen
- 70 - 101 years
- age and sex stratified
- 2871 persons
- postal questionnaire
- ATS/DLD questions

Reference Sub-group

Phase II:

- 319 healthy responders
- no lung disease
- no dyspnea gr. 4
- no heart disease or hypertension if dyspnea gr 3

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Methods: Sample/Spirometry

- 208 never-smokers were called in
- 95 were able to attend
- 71 performed acceptable spirometry

- Reference values from these 71 persons

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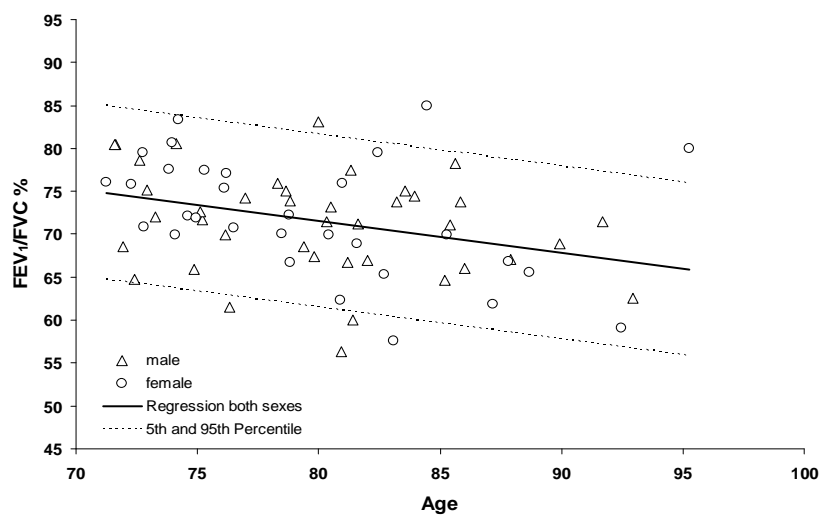
Results:

	Male n=40	Female n=31
Age distribution		
70-74 yrs	11	11
75-79 yrs	12	9
80-84 yrs	12	6
85-89 yrs	3	3
90+ yrs	2	2
FEV ₁ (liters)	2.72 (0.66)	1.71 (0.54)
FEV ₁ /FVC%	71.3 (6.0)	72.1 (6.9)

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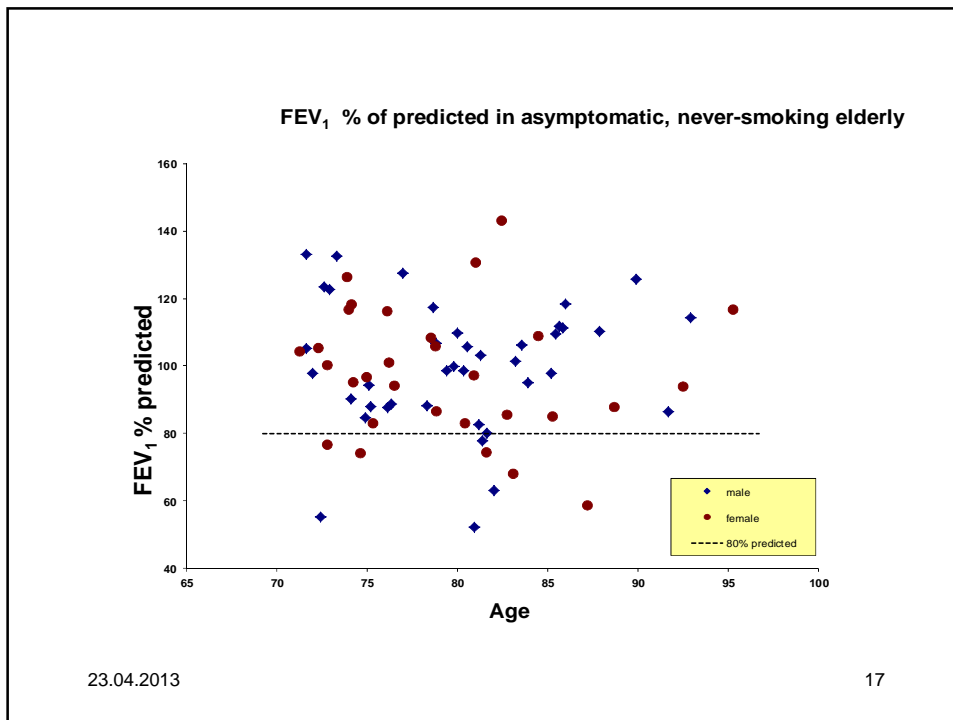
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FEV₁/FVC% in asymptomatic, elderly never-smokers from Bergen



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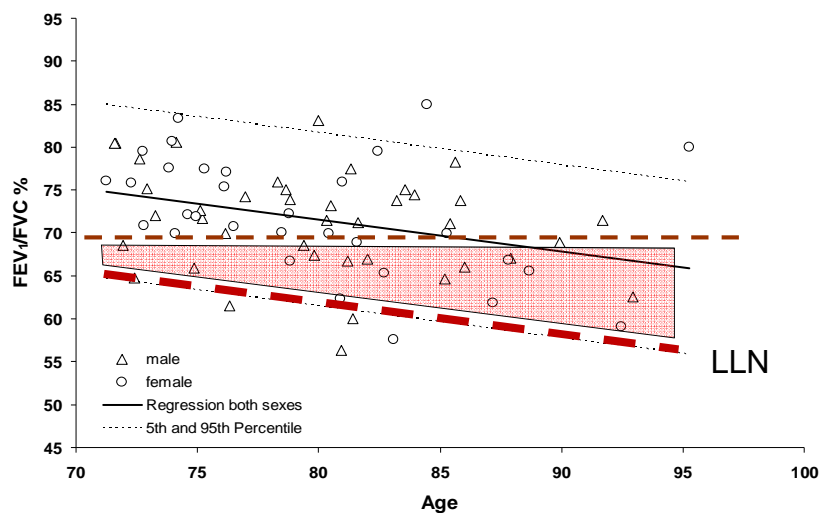


GOLD criteria for COPD diagnosis (2001)

- Airway inflammation due to noxious agents
- Airway Obstruction = $FEV_1/FVC \% < 70\%$
 - stage 1: $FEV_1 \% \text{ predicted} > 80\%$
 - stage 2: $FEV_1 \% \text{ predicted } 50 - 80\%$
 - stage 3: $FEV_1 \% \text{ predicted } 30 - 50\%$

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FEV₁/FVC% in asymptomatic, elderly never-smokers
..... from Bergen



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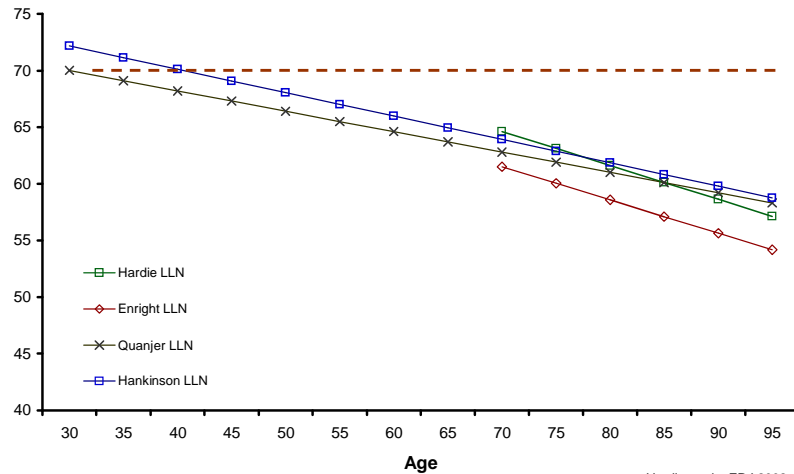
Percent of healthy elderly with "COPD" in the reference sample

	70-79 years	80+ years	All
	n=37	n=34	n=71
No COPD: FEV ₁ /FVC% >70	78%	50%	65%
Stage I COPD: FEV ₁ /FVC% <70; FEV ₁ % Pred. > 80	19%	32%	25%
Stage II COPD: FEV ₁ /FVC% <70; FEV ₁ % Pred. < 80	3%	18%	10%

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5th Percentile - LLN for FEV₁/FVC% from 4 reference value studies



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Hardie et al., ERJ 2002
 Enright et al., ARRD 1993
 Quanjer et al., ERJ 1992
 Hankinson et al., AJRCCM 1999

FEV₁/FVC ratio

0.7 ≠ 5th Percentile

1. Hankinson JL, Odencrantz JR, Fedan KB. Spirometric reference values from a sample of the general US population. Am J Respir Crit Care Med 1999; 159: 179-187.
2. Crapo RO, Morris AH, Gardner RM. Reference spirometric values using techniques and equipment that meet ATS recommendations. Am Rev Respir Dis 1981; 123: 659-664.
3. Enright PL, Kronmal A, Higgins M, Schenker M, Haponik EF. Spirometry reference values for women and men 65 to 85 years of age. Am Rev Respir Dis 1993; 147: 125- 133
4. Falaschetti E, Laiho J, Primatesta P, Purdon S: Prediction equations for normal and low lung function from the Health Survey for England. Eur Respir J 2004; 23: 456-463.

FEV₁/FVC ratio

0.7 ≠ 5th Percentile

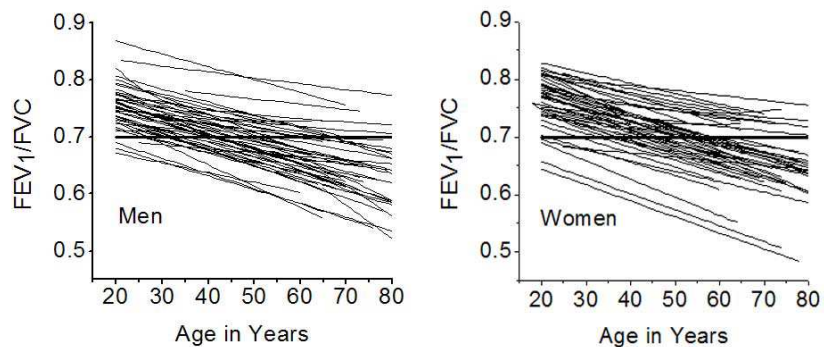
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FEV₁/FVC ratio

0.7 ≠ 5th Percentile

13. Hedenström H, Malmberg P, Agarwal K. Reference values for lung function tests in females. Regression equations with smoking variables. *Bull Europ Physiopathol Respir* 1985; 21: 551-557.
14. Hedenström H, Malmberg P, Fridriksson H.V.: Reference values for pulmonary function tests in men. Regression equations which include tobacco smoking variables. *Upsala J Med Sci* 1986; 91: 299-310.
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The LLN for FEV₁/FVC falls with age in healthy adults,
 lower limit of the normal range from 57 studies, age range
 20 – 80 years.



Swanney MP, QuanjerPH, et al. Thorax publ. online 11 Sept 2008

$$p[\text{predFEV}_1/\text{FVC}] = \frac{1}{RSD\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{\text{predFEV}_1/\text{FVC}-70}{RSD}\right)^2}$$

$$\text{Pr}[\text{predFEV}_1/\text{FVC} < 70] = \int_0^{70} p[\text{predFEV}_1/\text{FVC}] d[\text{predFEV}_1/\text{FVC}]$$

where "pred FEV₁/FVC" is value at given age and "RSD" is the residual standard deviation of the FEV₁/FVC regression

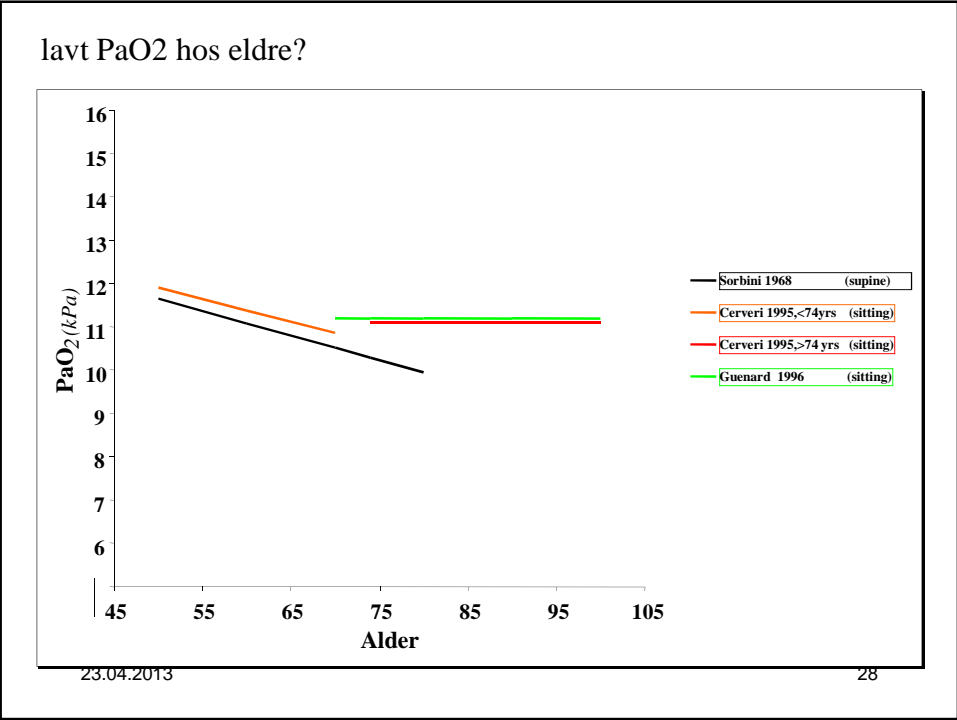
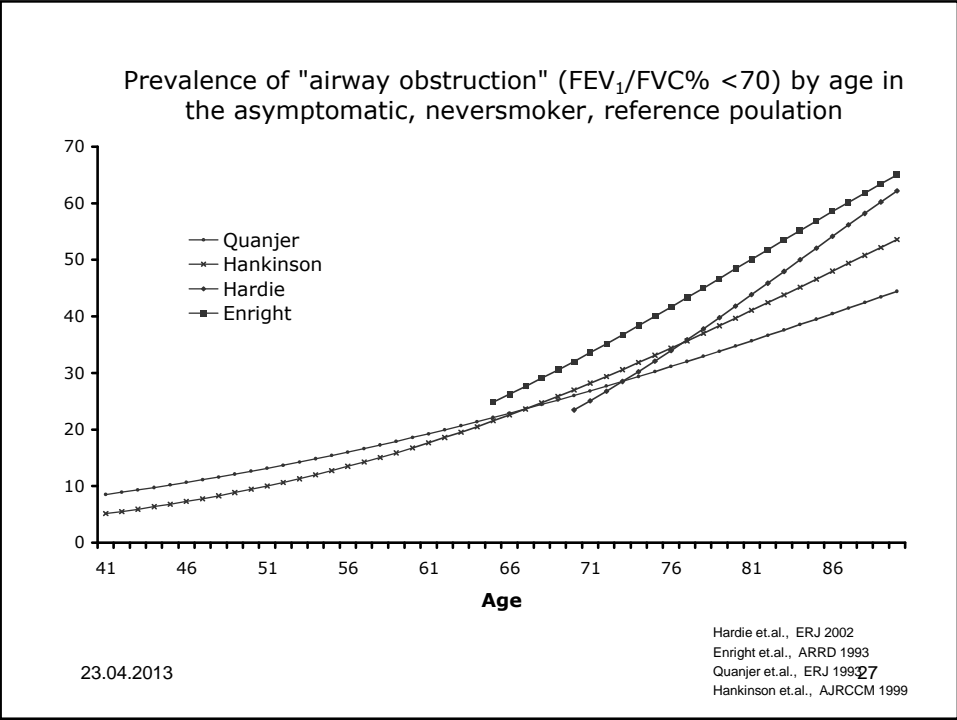
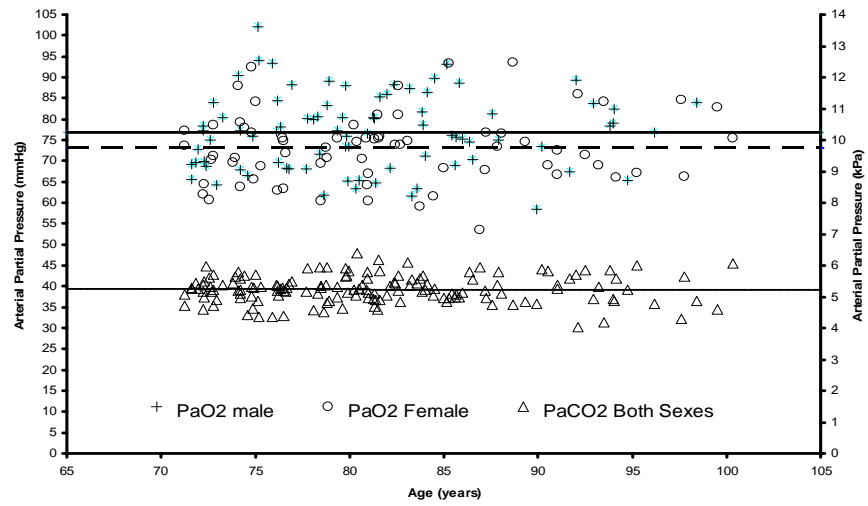


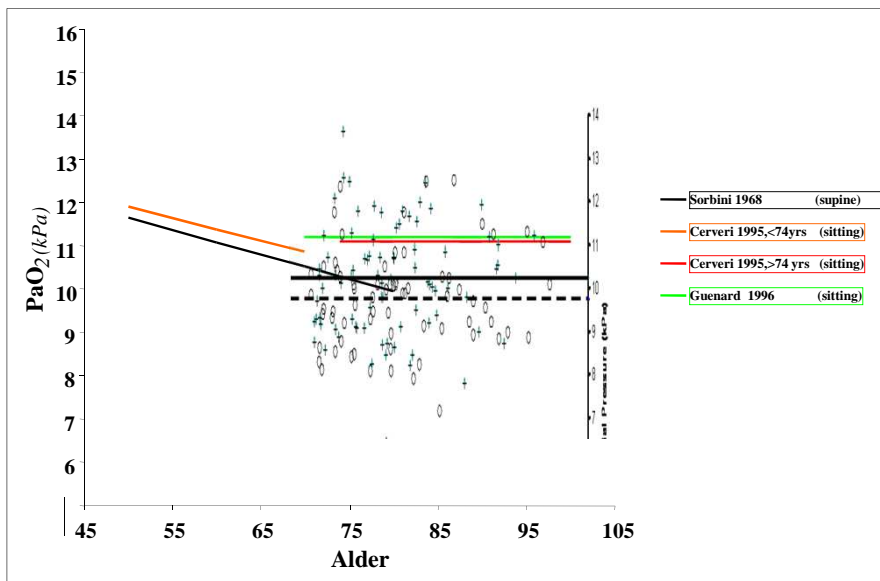
Figure 1. Arterial O2 and CO2 by age and sex



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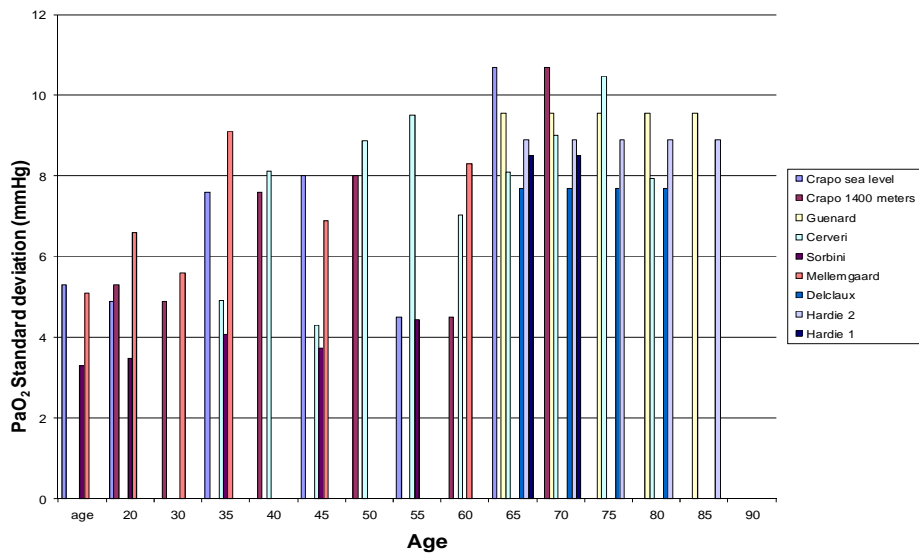
lavt PaO2 hos eldre?



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Populasjonsvariabilitet for PaO₂ etter Alder



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Table 5.
Reference Values for Arterial Blood Gases: Mean, lower limit of normal, and upper limit of normal*

	Male			Female		
	mean (SD)	Lower limit of normal	Upper limit of normal	mean (SD)	Lower limit of normal	Upper limit of normal
PaO₂ (kPa)	10.2 (1.2)	8.3		9.8 (1.1)	7.9	
AaO₂ (kPa)	3.3 (1.2)		5.3	3.7 (1.0)		5.5
SaO₂ (%)	95.3 (1.4)	93.0		94.8 (1.7)	92.0	
PaCO₂ (kPa)	5.2 (.44)		6.0	5.2 (.44)		6.0

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Konsekvenser....

Er det slik at «friske» eldre med

- FEV₁ mindre enn gjennomsnitt
- PaO₂ mindre enn gjennomsnitt

har kortere overlevelse (ift de over gjennomsnitt)???

(Slik tilfellet er for BT > gjennomsnitt...)

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FEV₁ og FVC

Risiko død 10år person 71-74 år, pr kvartiler av FEV1% pred og FVC%pred

		FEV ₁ %Pred			
Hazard Ratio * p< 0,05	n	Q1 (< 82%)	Q2 (82-95%)	Q3 (95-106%)	Q4 (>106%)
FVC %Pred	Q4 (>99%)	5,71*	2,52*	1,37	1
	Q3 (90-99%)	3,61*	1,83*	1,70*	1,31
	Q2 (80-90%)	2,66*	1,93*	1,98*	
	Q1 (< 80%)	3,52*	1,49	2,63	

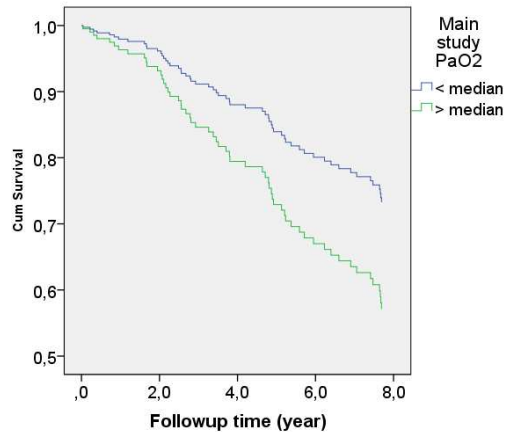
Skal presenteres ATS May 2013, Pittsburgh

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PaO₂ vs Overlevelse

Overlevelse sammenlignet over og under median PaO₂



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Hardie, HYPOXIA, Lake Louise, CA. Februar 2013

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Sammendrag

- lungealdring fører til endringer som ligner sykdom
- nåværende diagnostiske rutiner baserer seg på kunnskap om yngre aldersgrupper
- for å unngå betydelig overdiagnose må diagnostiske kriterier aldersjusteres

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Sammendrag:

- Forenkling er en god ting ...
- FEV₁/FVC% grenser
 - < 70 år ~ 70 %
 - 70 - 80 år ~ 65 %
 - > 80 år ~ 60 %
- FEV₁ kan ikke så lett forenkles...

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Sammendrag:

- PaO₂ i liggende stilling, over 70 år, LLN ca 8,0 kPa (8,5 kPa sittende)
- Likevel antagelig best å ha så store lunger som mulig...
- Ikke avklart om bedre med mer eller mindre PaO₂

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PaO₂ falls with increasing Age

