



# Sampling density as a predictor of prostate cancer in repeat prostate biopsy



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**Background :** Currently, it is recommended to take 8-12 cores in the first prostate biopsy, because it has been shown, that this scheme leads to a higher detection rate than in sextant biopsy<sup>1</sup>. Adjusting the number of cores according to prostate volume and patient's age was one of the principles of the Vienna nomogram<sup>2</sup>. Some of current nomograms for the prediction of positive prostate biopsy include also sampling density, which is a variable of number of cores related to prostate volume<sup>3</sup>. However, the optimal sampling density value has not been defined and little is known about its performance in different patient subgroups, including prostate re-biopsies.

**Aim :** The aim of this study is to assess predictive parameters of prostate cancer (PC) detection in patients with repeat prostate biopsy (PB).

**Materials and methods :** Between 11/2008 and 06/2014 a total of 1018 men underwent PB after initially negative biopsy. A total of 572, 269 and 177 patients had one or two or three and more previous standard PBs, respectively. Demographic (age) and clinical (prostate specific antigen [PSA], free/total PSA ratio, prostate size, PSA density [PSA / prostate size], number of cores, sampling density [prostate size / number of cores], number of previous PBs, digital rectal examination [DRE] and transrectal ultrasound [TRUS] findings) parameters were recorded (Table 1.) and assessed for PC prediction by the Chi-squared and analysis of variance methods for categorical or continuous data, respectively.

Table 1. Study group characteristics	N = 1018
Age, years (mean; SD)	66.1 ± 7.23
PSA, ng/ml (mean; min - max)	9.4 (0.47 - 45.97)
f/t PSA, % (mean; min - max)	15.6 (2.2 - 44.0)
Prostate volume, ml (mean; min - max)	51.7 (8.0-200.0)
PSA density (mean; min - max)	0.20 (0.03 - 2.65)
Sampling density (mean; min - max)	3.8 (0.5 - 15.3)
DRE positive	220 (21.6 %)
TRUS positive	289 (28.4 %)
Number of cores, median (min - max)	12 (10-36)
10 - 12 cores	564 (55.4 %)
13 - 17 cores	91 (8.9 %)
18 - 36 cores	363 (35.7 %)
Number of previous Bx, min-max	1-9
1	572 (56.2 %)
2	269 (26.4 %)
≥ 3	177 (17.4 %)

PSA - prostate specific antigen, f/t PSA - free/total PSA ratio, DRE - digital rectal examination, TRUS - transrectal ultrasound, Bx - biopsy

Fig 1. The effect of change in sampling density on the PC detection rate

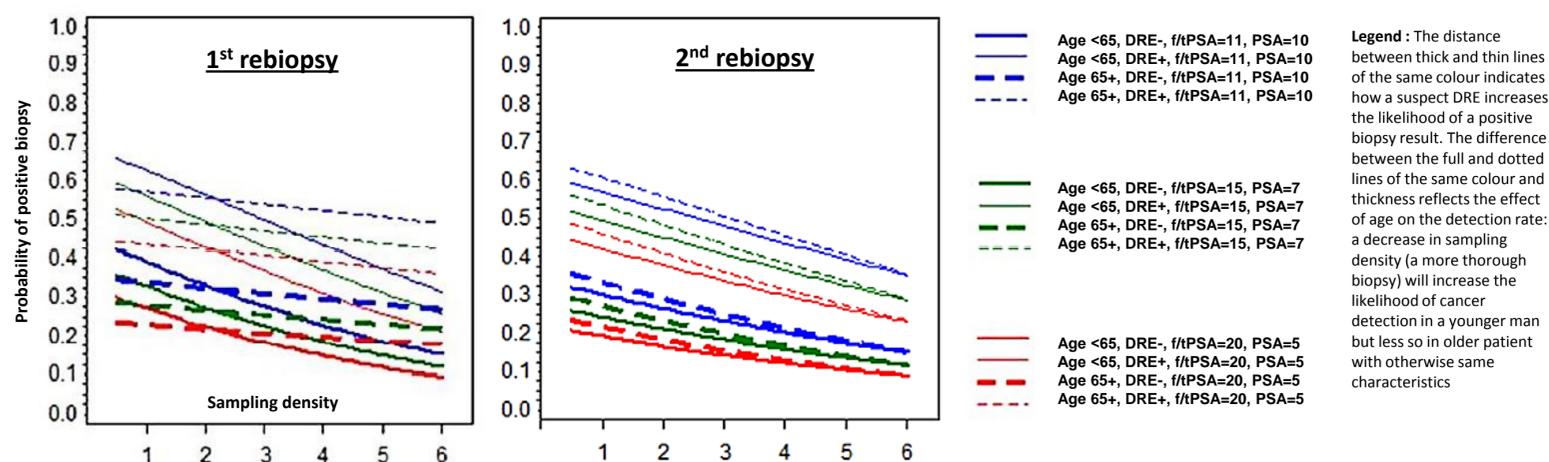


Table 2. Differences between groups	Prostate cancer (n=258)	No cancer (n=760)	p-value
Age, years (mean)	67.6	65.5	< 0.001
PSA, ng/ml (mean)	10.9	9.0	< 0.001
f/t PSA, % (mean)	13.9	16.2	< 0.001
Prostate volume, ml (mean)	43.5	54.6	< 0.001
PSA density (mean)	0.32	0.20	< 0.001
Sampling density (mean)	3.1	4.0	< 0.001
DRE positive	82 (31.8%)	127 (16.7%)	HR 1.8 (0.88-6.25)
TRUS positive	96 (37.2%)	179 (23.6%)	HR 1.6 (1.1 - 5.25)
Biopsy < 24 cores (n=747)	179 (24.0%)	568 (76.0%)	0.1955
Biopsy ≥ 24 cores (n= 271)	79 (29.1%)	192 (70.9%)	

Table 3. Statistics : - univariate analysis	1st rebiopsy	2nd rebiopsy	≥ 3rd rebiopsy
Age ≥ 65 years	0.0137	0.6354	0.2262
Sampling density	0.0070	0.0070	0.0010
Digital rectal exam	<0.0001	0.0003	0.7940
PSA	0.0011	0.0361	0.0705
f/t PSA	0.0059	0.0056	0.0702
- multivariate analysis			
Age ≥ 65 years	0.0833	0.5592	0.5407
Sampling density	0.0001	0.3435	0.0426
Digital rectal exam	0.0001	0.0028	0.8762
PSA	0.0562	0.1612	0.1504
f/t PSA	0.0443	0.1615	0.5658

**Results :** Prostate cancer was detected in a total of 258 patients (25.3 %). Saturation PB (≥ 24 cores) detected about 18 % more cancers. Patients with PC were older, had higher PSA level and PSA density, lower free/total PSA ratio and smaller prostate (all p-values < 0,001; Table 2.). Mean sampling density was also significantly lower in patients with PC (3,1 vs 4,0; p < 0,001). Sampling density was also predictive of PC detection in subgroups of patients with one, two or three and more negative previous standard PBs (p=0.007, p=0.007 and p=0.001, respectively). Patient with positive DRE and TRUS had 1.8 and 1.6 times higher probability of positive PB, respectively. Age, free/total PSA ratio and sampling density were independent predictors of PC detection in multivariate analysis.

**Conclusion :** Our study shows that higher number of biopsy cores in relation with prostate size (lower sampling density) may improve PC detection in patients scheduled for repeated PB.

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**References :**  
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