***Objective*:** Compare the detection rate of prostate cancer between Transperineal (TP) and Transrectal (TR) biopsy approaches.

Data preparation: Use first six observations for illustration

Obs	subject_id	race	ghx_hasfamilyhisotry_v_0	bx_1_date	bx1approach	bx_1_provider	bx_1_sys_gleason	bx_1_trg_gleason	mri_1_prostatevolume	psa_1_value	combined	outcome
1	218	Caucasian	No	2020-08-26	Transrectal	SIDANA	3+3	benign	.	7.4	1	0
2	591	African American	Yes	2017-07-13	Transrectal	SIDANA	3+3	.	44.5	10.1	1	0
3	597	African American	No	2017-04-01	Transrectal	SIDANA	3+4	.	.	6.9	2	1
4	604	Caucasian	No	2017-06-07	Transrectal	SIDANA	benign	.	.	16.3	0	0
5	612	African American	No	2017-06-18	Transrectal	SIDANA	benign	.	.	1.6	0	0
6	614	African American	Yes	2017-11-27	Transrectal	SIDANA	.	3+4	44.5	10.1	2	1

- *Bx_1_provider*: All doctors vs Dr. Sidana
- *Combined gleason*: Defined as the maximum value between ‘bx_1_sys_gleason’ and ‘bx_1_trg_gleason’
- *Outcome*: if combined gleason is ‘benign’ or ‘3+3’, outcome is coded as ‘0’; otherwise, it is coded as ‘1’.

Results – Chi-Square test

- Based on the Chi-Square test, a statistically significant association was found between bx1approach and the outcome for the data from all doctors.
- However, no statistically significant association was observed for the data from Dr. Sidana.

all doctors

The FREQ Procedure

Frequency
Percent
Row Pct
Col Pct

Table of bx1approach by outcome			
	outcome		
bx1approach(Biopsy 1 approach?)	0	1	Total
Transrectal	933 47.46 50.98 95.01	897 45.63 49.02 91.16	1830 93.08
Transperineal	49 2.49 36.03 4.99	87 4.43 63.97 8.84	136 6.92
Total	982 49.95	984 50.05	1966 100.00
Frequency Missing = 7			

Statistics for Table of bx1approach by outcome

Statistic	DF	Value	Prob
Chi-Square	1	11.3238	0.0008
Likelihood Ratio Chi-Square	1	11.4665	0.0007
Continuity Adj. Chi-Square	1	10.7336	0.0011
Mantel-Haenszel Chi-Square	1	11.3181	0.0008
Phi Coefficient		0.0759	
Contingency Coefficient		0.0757	

Dr. Sidana

The FREQ Procedure

Frequency
Percent
Row Pct
Col Pct

Table of bx1approach by outcome			
	outcome		
bx1approach(Biopsy 1 approach?)	0	1	Total
Transrectal	119 28.61 41.75 71.69	166 39.90 58.25 66.40	285 68.51
Transperineal	47 11.30 35.88 28.31	84 20.19 64.12 33.60	131 31.49
Total	166 39.90	250 60.10	416 100.00

Statistics for Table of bx1approach by outcome

Statistic	DF	Value	Prob
Chi-Square	1	1.2924	0.2556
Likelihood Ratio Chi-Square	1	1.3016	0.2539
Continuity Adj. Chi-Square	1	1.0590	0.3034
Mantel-Haenszel Chi-Square	1	1.2893	0.2562
Phi Coefficient		0.0557	
Contingency Coefficient		0.0557	

Results – multivariate logistic regression model

- Multivariate logistic regression was conducted to assess whether the biopsy approach predicted the outcome after adjusting for other covariates.
- Bx1approach was found to have effect on the outcome for the data from all doctors.
- But it did not have an effect on the outcome for the data from Dr. Sidana only.

all doctors

Analysis of Maximum Likelihood Estimates

Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	0.4869	0.1917	6.4471	0.0111
bx1approach	Transperineal	1	0.3272	0.1091	8.9909	0.0027
race	African American	1	0.2859	0.1461	3.8313	0.0503
race	Other	1	-0.7614	0.2416	9.9339	0.0016
ghx_hasfamilyhisotry	Yes	1	0.0235	0.0705	0.1110	0.7391
psa_1_value	10 < psa <= 20	1	-0.00578	0.1585	0.0013	0.9709
psa_1_value	psa > 20	1	1.1322	0.2292	24.3897	<.0001
mri_1_prostatevolume	40 < volume <= 60	1	0.0363	0.0881	0.1701	0.6801
mri_1_prostatevolume	volume > 60	1	-1.0240	0.1039	97.1612	<.0001

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
bx1approach Transperineal vs Transrectal	1.924	1.254	2.951
race African American vs Caucasian	0.827	0.622	1.100
race Other vs Caucasian	0.290	0.142	0.592
ghx_hasfamilyhisotry Yes vs No	1.048	0.795	1.382
psa_1_value 10 < psa <= 20 vs psa <= 10	3.067	2.130	4.416
psa_1_value psa > 20 vs psa <= 10	9.569	4.896	18.702
mri_1_prostatevolume 40 < volume <= 60 vs volume <= 40	0.386	0.293	0.509
mri_1_prostatevolume volume > 60 vs volume <= 40	0.134	0.096	0.187

Dr. Sidana

Analysis of Maximum Likelihood Estimates

Parameter		DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept		1	0.9610	0.3802	6.3882	0.0115
bx1approach	Transperineal	1	0.2031	0.1297	2.4512	0.1174
race	African American	1	-0.0520	0.2708	0.0369	0.8477
race	Other	1	-0.2215	0.4623	0.2295	0.6319
ghx_hasfamilyhisotry	Yes	1	0.1177	0.1384	0.7232	0.3951
psa_1_value	10 < psa <= 20	1	-0.0711	0.3680	0.0373	0.8468
psa_1_value	psa > 20	1	1.3332	0.5722	5.4284	0.0198
mri_1_prostatevolume	40 < volume <= 60	1	0.0320	0.1792	0.0318	0.8584
mri_1_prostatevolume	volume > 60	1	-1.0961	0.2322	22.2825	<.0001

Odds Ratio Estimates

Effect	Point Estimate	95% Wald Confidence Limits	
bx1approach Transperineal vs Transrectal	1.501	0.903	2.496
race African American vs Caucasian	0.722	0.437	1.194
race Other vs Caucasian	0.610	0.155	2.394
ghx_hasfamilyhisotry Yes vs No	1.265	0.736	2.176
psa_1_value 10 < psa <= 20 vs psa <= 10	3.290	1.512	7.159
psa_1_value psa > 20 vs psa <= 10	13.401	2.501	71.799
mri_1_prostatevolume 40 < volume <= 60 vs volume <= 40	0.356	0.212	0.597
mri_1_prostatevolume volume > 60 vs volume <= 40	0.115	0.056	0.237

Results – mixed-effects logistic regression model

- A mixed-effects logistic regression was performed to account for potential correlations among patients treated by the same doctor due to doctor-specific factors.

- Surprisingly, after adjusting for doctors as a random effect, bx1approach showed no significant effect on the outcome across the data from all doctors.

Type III Tests of Fixed Effects				
Effect	**Num DF**	**Den DF**	**F Value**	**Pr > F**
bx1approach	1	1274	3.53	0.0604
race	2	1274	6.02	0.0025
ghx_hasfamilyhisotry	1	1274	0.02	0.8761
psa_1_value	2	1274	38.23	<.0001
mri_1_prostatevolume	2	1274	67.85	<.0001

Conclusions:

- These results suggest that effect of bx1approach on the outcome may be influenced by doctor-specific factors.

- Without adjusting for doctors factors, the model captures differences in detection rates that may be due to variations in individual doctors' techniques, experience rather than the biopsy approach itself.