

## Diagnosing Obstructive Sleep Apnea

75 patients referred by community physicians to sleep specialists were enlisted in a study aimed at finding simple indicators of *obstructive sleep apnea* (OSA). At the time of the study, the "gold standard" for diagnosis of this condition was a costly overnight sleep study which was limited in availability. The primary aim of the investigators was to find simple rules which could "rule out" OSA without the need for the overnight study.

Amongst others, the following variables were considered:

- age (in years)
- sex
- bmi - body mass index
- neck - neck circumference (cm.)
- pharynx - pharyngeal grade (I,II,III,IV)
- htn - diagnosis of hypertension (y/n)
- etoh - alcohol consumption (y/n)
- smoke - smoker (yes,ex,no)
- snore - snores during sleep (y/n)
- choke - chokes during sleep (y/n)
- apnea - stops breathing during sleep (y/n)
- ess - epworthly sleepiness (daytime) index
- rdi - respiratory distress index (sleep study outcome)

Data Listing

Observation 1

age	39	sex	Female	bmi	33.17773
htn	No	etoh	No	smoke	No
snore	Yes	choke	Yes	apnea	Yes
neck	37	pharynx	Class II	ess	0
rdi	10				

Observation 2

age	55	sex	Male	bmi	38.30238
htn	No	etoh	No	smoke	No
snore	Yes	choke	No	apnea	Yes
neck	43	pharynx	Class II	ess	2
rdi	6.7				

Simple Descriptive Summaries

Variable	Obs	Mean	Std. Dev.	Min	Max
age	75	47.54667	11.52705	26	74
bmi	70	33.1268	6.954945	19.1953	51.2653
ess	58	11.68966	5.390723	0	22
rdi	75	29.956	34.27798	0	138

age

Percentiles	Smallest		
1%	26	26	
5%	27	26	
10%	32	26	Obs 75
25%	40	27	Sum of Wgt. 75
50%	47		Mean 47.54667
		Largest	Std. Dev. 11.52705
75%	55	70	
90%	64	70	Variance 132.8728
95%	70	73	Skewness .2124957
99%	74	74	Kurtosis 2.695111

rdi

Percentiles		Smallest		
1%	0	0		
5%	.5	0		
10%	2	0	Obs	75
25%	6	.5	Sum of Wgt.	75
50%	17.3		Mean	29.956
		Largest	Std. Dev.	34.27798
75%	40	102		
90%	88	122	Variance	1174.98
95%	102	134	Skewness	1.531878
99%	138	138	Kurtosis	4.503094

. tabulate sex

sex	Freq.	Percent	Cum.
Female	19	25.33	25.33
Male	56	74.67	100.00
Total	75	100.00	

. tabulate smoke

smoke	Freq.	Percent	Cum.
No	49	65.33	65.33
Ex-smoker	17	22.67	88.00
Yes	9	12.00	100.00
Total	75	100.00	

. tabulate pharynx

pharynx	Freq.	Percent	Cum.
Class I	17	22.67	22.67
Class II	17	22.67	45.33
Class III	14	18.67	64.00
Class IV	27	36.00	100.00
Total	75	100.00	

# Graphical Summaries

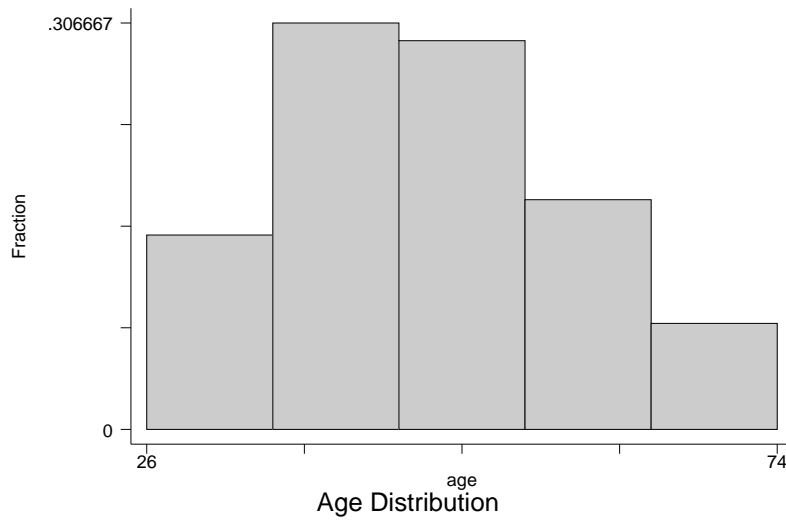
Stem-and-leaf plot for rdi

rdi rounded to integers

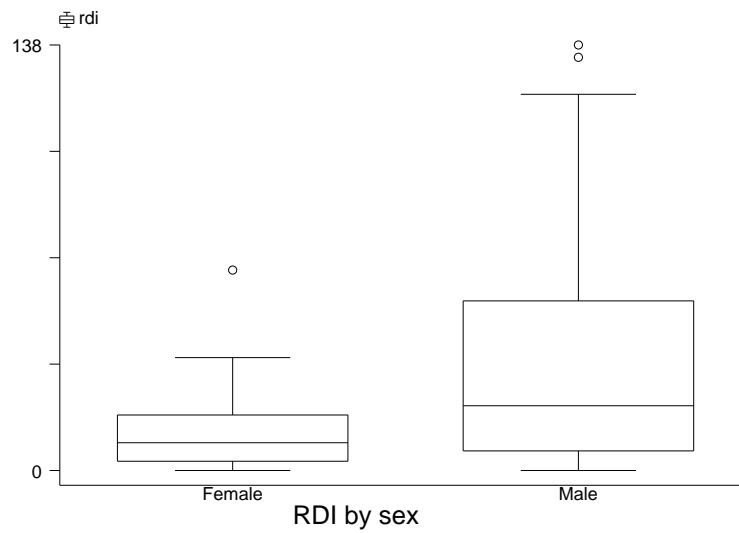
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0* | 0001112233333555566667788999
1* | 0233555577899
2* | 00002237778
3* | 2257
4* | 048
5* | 0
6* | 0035
7* | 79
8* | 789
9* | 0
10* | 12
11* |
12* | 2
13* | 48
    
```

Histogram

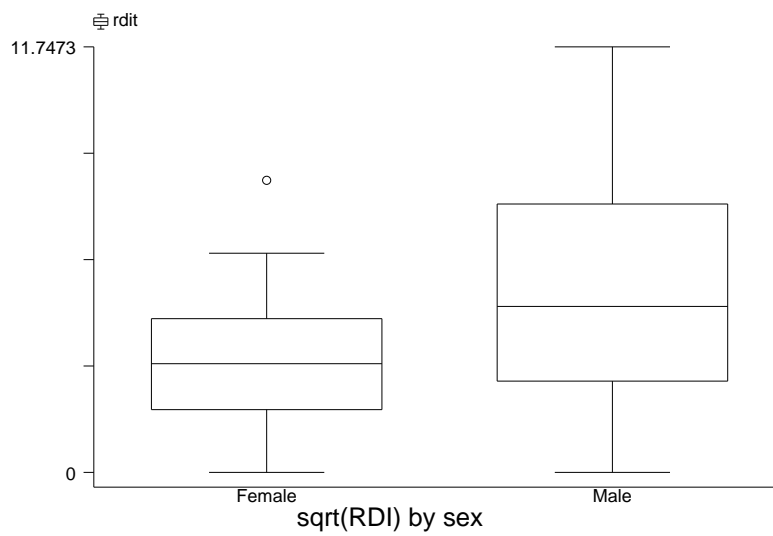


### Boxplots



### Transformations

#### Square Root-transformed RDI

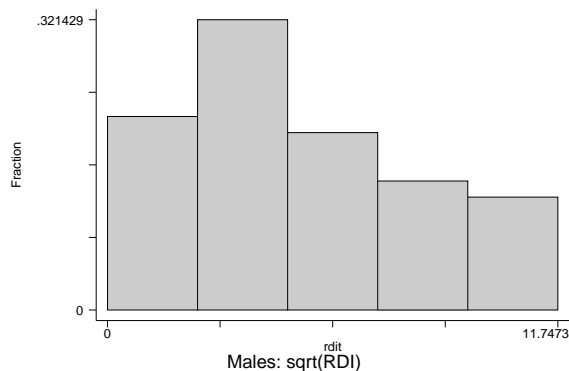
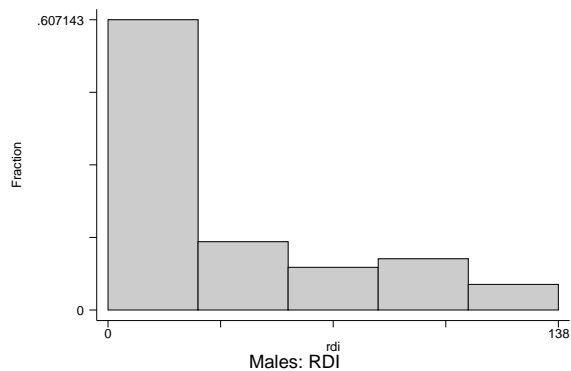


### Normal Distributions

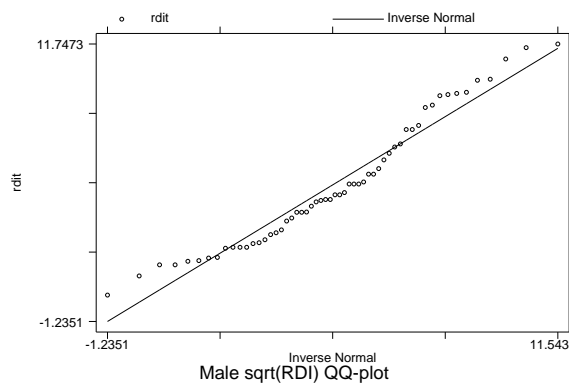
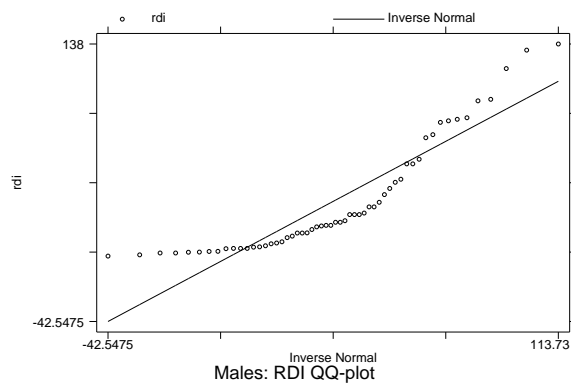
#### Summaries for Males: RDI and sqrt(RDI)

Variable	Obs	Mean	Std. Dev.	Min	Max
rdi	56	35.59107	37.07915	0	138
rdit	56	5.153964	3.03181	0	11.74734

## Assessing Normality with Quantile Plots



### Normal Quantile Plots

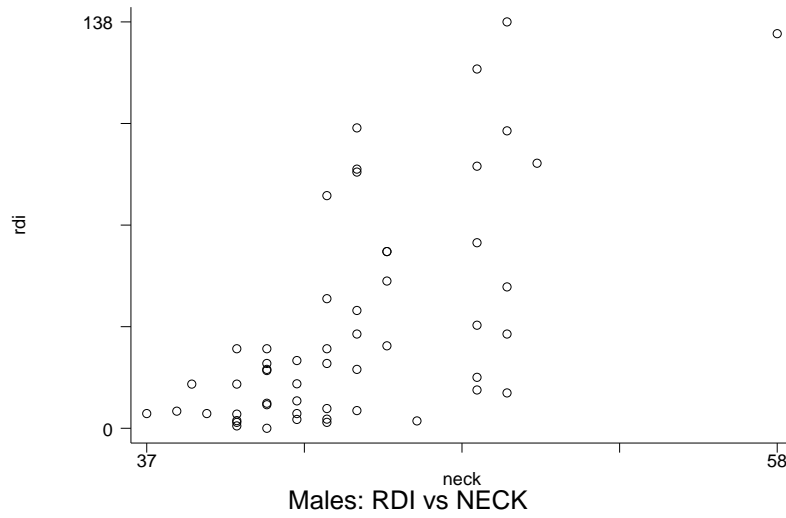


### Clinical Cutoff for OSA Diagnosis

RDI < 20	26	46.43	46.43
RDI >= 20	30	53.57	100.00
Total	56	100.00	

# Bivariate Description

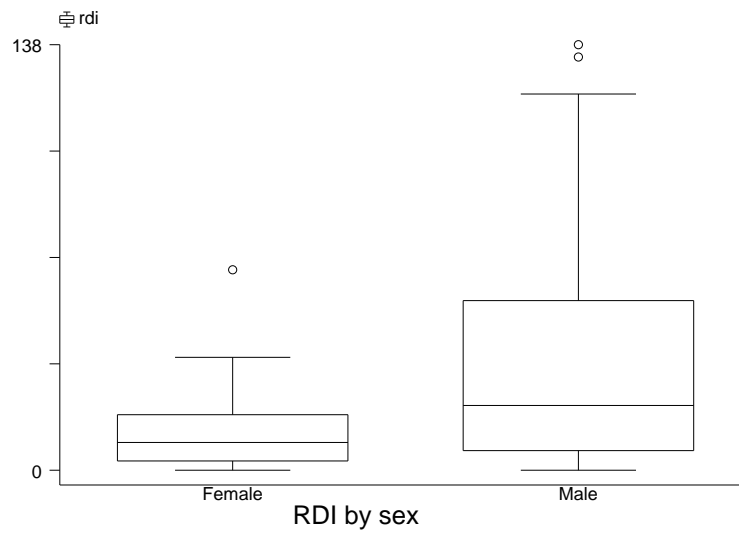
## Scatterplots



## Pearson Correlation Co-efficients

	rdi	neck
rdi	1.0000	
neck	0.6378	1.0000

## Parallel Boxplots



## Cross-tabulations

## Cross-tabulation of Sex and OSA20

## Frequencies

sex	osa20		Total
	RDI <= 20	RDI > 20	
Female	16	3	19
Male	26	30	56
Total	42	33	75

## Cell percentages

sex	osa20		Total
	RDI <= 20	RDI > 20	
Female	21.33	4.00	25.33
Male	34.67	40.00	74.67
Total	56.00	44.00	100.00

## Row percentages

sex	osa20		Total
	RDI <= 20	RDI > 20	
Female	84.21	15.79	100.00
Male	46.43	53.57	100.00
Total	56.00	44.00	100.00

## Column percentages

sex	osa20		Total
	RDI <= 20	RDI > 20	
Female	38.10	9.09	25.33
Male	61.90	90.91	74.67
Total	100.00	100.00	100.00