



## Screening of Pediatric Sleep-Disordered Breathing

### A Proposed Unbiased Discriminative Set of Questions Using Clinical Severity Scales

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#### e-Appendix 1.

##### Results

###### *Descriptive analyses*

Snoring is traditionally perceived as the primary symptom of SDB and a screening criteria applied to our selected community sample, we found the following prevalence; 21.7% never, 10.7% rarely, 14.9% occasionally, 16.6% frequently and 36.2% almost always. Further, there is a significant disparity of loudness of snoring per endorsement ( $\chi^2(20) = 1616.2, p = .00$ ): more specifically, for *rarely* 79.28% snores mildly quiet, 18.02% medium loud, 0.9% very loud and 1.8% extremely loud; for *occasionally* 49.36% snores mildly quiet, 44.23% medium loud, and 6.41% loud; for *frequently* 21.51% snores mildly quiet, 52.33% medium loud, 22.09% loud, and 4.07% very loud; and for children that *almost always* snore the loudness of their snoring was 6.08% mildly quiet, 24.87% medium loud, 26.98% loud and similar for very loud, and 15.08% extremely loud. Hence, the more frequently children are reported to snore, the louder they will snore.

###### **Per AHI cut-off groups**

Children were of similar age ( $6.8 \pm 0.7$  years) across the AHI cut-off groups (Online Supplement Table 1). When corrected for age and gender, children in AHI\_G6 had a significant higher BMI ( $21.7 \pm 6.2 \text{ kg/m}^2$ ) than children in AHI\_G1 ( $17.7 \pm 4.4 \text{ kg/m}^2$ ), AHI\_G2 ( $17.8 \pm 4.8 \text{ kg/m}^2$ ), and AHI\_G3 ( $18.5 \pm 4.4 \text{ kg/m}^2$ ) with no other groups being different in weight. Significantly, more African American children fell within the higher AHI cut-off groups (Online Supplement Table 1). Details of the NPSG results across the AHI cut-off groups can be found in Online Supplement Table 2; i.e., only the respiratory indices (AHI, AI, OAI, Nadir SaO<sub>2</sub>, respiratory arousal index) and sleep pressure score<sup>40</sup> being significantly different between them.

No significant differences between the AHI cut-off groups were found for the following parental reported physical complaints from the questionnaire; allergy, ADHD behavior and asthma or in the distribution of the remainder health questions of the questionnaire such as frequent colds and flu symptoms, or runny nose were found.

###### **Step 2: Mokken Scale Analysis (MSA)**

###### *MSA in total sample*

We ran a MSA on these 11 questions which indicated that only Factor 1 showed scalability properties in the total sample (Factor 2 had an  $H < 0.5$ ). Therefore, we assessed the Factor 1 scalability (or the order of

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questions, or hereafter severity hierarchy of complaints) within each AHI cut-off groups. MSA of the 7 items of Factor 1 revealed a scale with medium scalability strength ( $H=0.57$ ) but good reliability ( $\rho$ ) of 0.86. Daytime mouth breathing showed a consistent bad fit regarding the statistical fit assumptions in the total sample and across the clinical AHI cut-off groups and was therefore omitted. This resulted in an increase of  $H$  (0.65) and reliability (0.88), and a hierarchy (Figure 1, dotted line for the total sample) of Shake child to breathe (Q1) (mean of 0.24,  $H=0.68$ ), Apnea during sleep (Q2) (mean of 0.58,  $H=0.65$ ), Struggle breathing when asleep (Q3) (mean of 0.81,  $H=0.66$ ), Breathing concerns while asleep (Q4) (mean of 1.18,  $H=0.68$ ), Loudness of snoring (Q5) (mean of 1.31,  $H=0.58$ ) and Q6 (mean of 2.81,  $H=0.67$ ) resulted. The weakest item ( $H$ ) was Loudness of snoring (Q5), as can also be visually seen by the decline in the monotonicity function per MSA (Figure 1).

### Step 3: ROC per question

When AHI cut-off groups are being compared; (based on their good accuracy) Loudness of snoring (Q5) discriminated between AHI\_G1 and AHI\_G6 when it was more than loud (>loud), i.e., sensitivity of 71.43% [53.7-85.4] and specificity 86.74% [83.5-89.6]; between AHI\_G2 and AHI\_G6 when it was more than loud (>loud), i.e., sensitivity of 71.43% [53.7-85.4] and specificity 82.69% [75.8-88.3]; between AHI\_G3 and AHI\_G6 when it was more than loud (>loud), i.e., sensitivity of 71.43% [53.7-85.4] and specificity 73.47% [58.9-85.1]. Snoring during sleep (Q6) had discriminatory power between AHI\_G1 and AHI\_G6 when it occurred more than 4 times per week (>frequently), i.e., sensitivity of 100% [89.7-100] and specificity 70.98% [67.4-74.4]; AHI\_G2 and AHI\_G6 when it occurred more than 4 times per week (>frequently), i.e., sensitivity of 100% [89.7-100] and specificity 66.84% [59.6-73.5]; and AHI\_G3 and AHI\_G6 when it occurred more than 4 times per week (>frequently), i.e., sensitivity of 100% [89.7-100] and specificity 57.89% [44.1-70.9]. The higher the AHI, the less specific these traditional cardinal symptoms were, a finding that closely concurred with the MSA (as can be seen on the figures).

Given the nature of our questionnaire, the findings overall indicate that none of the questions alone were sufficiently accurate to discriminate between *each* of AHI cut-off groups. This supported the MSA being suggestive that a set of questions was needed to more accurate discrimination along the clinical AHI severity groups.

Of interest, *a posteriori* we re-drew the ROC for the severity hierarchies in the AHI cut-off groups when children with parental reported asthma, allergies, colds, runny noses or weight problems were excluded, and as would be expected, this post-hoc verification indeed affected sensitivity and/or specificity.



**e-Table 1.** Descriptive information per AHI cut-off group in a community sample: Age, BMI and Ethnicity

	AHI cut-off groups										Anova	p-value		
	AHI≤1	1>AHI≤2	2>AHI≤3	3>AHI≤5	5>AHI<10	AHI≥10								
	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd	Mean ± sd				
	n	CI 95%	CI 95%	CI 95%	CI 95%	CI 95%	CI 95%	CI 95%	CI 95%	CI 95%				
<b>age</b>	687	6.8 ± 0.7 6.8 – 6.9	205	6.8 ± 0.7 6.7 – 6.9	66	6.9 ± 0.7 6.7 – 7.0	61	6.6 ± 0.6 6.5 – 6.8	60	6.8 ± 0.8 6.6 – 7.0	41	7.0 ± 0.9 6.7 – 7.3	F(5, 1114)=1.3	0.28
<b>BMI</b>	626	17.7 ± 4.4 17.3 – 18.0	184	17.8 ± 4.8 17.3 – 18.5	60	18.5 ± 4.4 17.4 – 19.7	49	19.5 ± 4.8 18.1 – 20.9	44	19.7 ± 5.5 18.0 – 21.3	34	21.7 ± 6.2 19.5 – 23.8	F(5, 991)=7.3	<b>0.00001</b>
	n	%*	%*	%*	%*	%*	%*	%*	%*	%*		Chi-square		
<b>Ethnicity</b>	639		178		56		52		53		36		$\chi^2(10)=35.9$	<b>0.0001</b>
WNH		44.5		11.5		3.6		3.3		2.7		1.4		
AA		14.5		3.7		1.5		1.4		2.4		1.7		
Other		4.0		2.3		0.5		0.5		0.2		0.5		

Significant results in bold. \*percentage of Total Count (N=1014), **AHI**: Apnea Hypopnea Index, **AI**: Apnea Index, **OAI**: Obstructive Apnea Index, **SAI**:

Spontaneous Arousal Index, **RAI**: Respiratory Arousal Index, **SEI**: Sleep Efficiency Index, **SOL**: Sleep Onset Latency, **REM**: Rapid Eye Movement Sleep, **TST**:

total sleep time, **SWS**: Slow Wave Sleep, **SPS**: sleep pressure score, **BMI**: Body Mass Index: kg/m<sup>2</sup>, **WNH**: White Non-Hispanic, **AA**: African American,

**Other**: Mixed Ethnicity



**e-Table 2.** NPSG sleep parameters per AHI cut-off group in the community sample

	AHI≤1		1>AHI≤2		2>AHI≤3		3>AHI≤5		5>AHI<10		AHI≥10		Kruskall-Wallis	p-value
	n	Mean ± sd CI 95%	n	Mean ± sd CI 95%	n	Mean ± sd CI 95%	n	Mean ± sd CI 95%	n	Mean ± sd CI 95%	n	Mean ± sd CI 95%		
<b>AHI</b>	695	0.4 ± 0.3 0.4 – 0.5	210	1.4 ± 0.3 1.3 – 1.4	66	2.5 ± 0.3 2.4 – 2.6	61	3.8 ± 0.5 3.6 – 3.9	60	6.9 ± 1.4 6.6 – 7.3	41	20.1 ± 9.5 17.1 – 23.1	H(5,N=1133) =863.8	<b>0.0001</b>
<b>AI</b>	695	0.4 ± 0.8 0.3 – 0.4	210	0.9 ± 0.5 0.8 – 1.0	66	1.2 ± 0.8 1.0 – 1.3	61	1.4 ± 0.9 1.1 – 1.6	60	1.8 ± 1.5 1.4 – 2.2	41	5.5 ± 7.0 3.3 – 7.7	H(5,N= 1133) =430.9	<b>0.0001</b>
<b>OAI</b>	695	0.1 ± 0.4 0.0 – 0.1	210	0.2 ± 0.1 0.1 – 0.2	66	0.3 ± 0.4 0.2 – 0.4	61	0.5 ± 0.6 0.4 – 0.7	60	1.1 ± 1.3 0.8 – 1.4	41	3.9 ± 3.7 2.7 – 5.1	H(5,N= 1133) =336.8	<b>0.0001</b>
<b>Nadir SaO2</b>	695	93.0 ± 5.1 92.7 – 93.4	210	91.5 ± 3.6 91.0 – 92.0	66	90.1 ± 3.8 89.2 – 91.1	61	87.6 ± 6.6 86.0 – 89.3	60	85.3 ± 9.8 82.7 – 87.8	41	79.6 ± 10.9 76.2 – 83.1	H(5,N= 1133) =287.1	<b>0.0001</b>
<b>SAI</b>	695	7.9 ± 4.5 7.6 – 8.3	210	7.7 ± 4.5 7.1 – 8.3	66	8.2 ± 4.7 7.1 – 9.4	61	8.7 ± 6.7 7.0 – 10.4	60	6.4 ± 5.8 4.9 – 7.9	41	6.4 ± 5.0 4.9 – 8.0	H(5,N= 1133) =22.7	<b>0.0004</b>
<b>RAI</b>	695	0.8 ± 1.9 0.6 – 0.9	210	1.5 ± 4.2 0.9 – 2.0	66	1.8 ± 1.9 1.3 – 2.3	61	3.0 ± 3.3 2.2 – 3.9	60	4.7 ± 3.5 3.8 – 5.7	41	9.8 ± 6.4 7.8 – 11.9	H(5,N= 1133) =285.5	<b>0.0001</b>
<b>SEI</b>	692	89.8 ± 7.3 89.3 – 90.4	210	90.1 ± 8.1 89.0 – 91.2	66	90.7 ± 8.1 88.7 – 92.7	61	90.0 ± 9.4 87.6 – 92.4	60	90.9 ± 7.2 89.0 – 92.8	41	88.3 ± 10.7 84.9 – 91.7	H(5,N= 1130) =5.7	0.34
<b>SOL (min)</b>	695	22.8 ± 23.0 21.1 – 24.5	210	23.4 ± 26.8 19.8 – 27.1	66	20.8 ± 21.7 15.5 – 26.1	61	20.2 ± 21.4 14.7 – 25.6	60	19.4 ± 26.0 12.7 – 26.2	41	16.6 ± 17.3 11.1 – 22.0	H(5,N= 1133) =9.5	0.10
<b>REM latency (min)</b>	694	145.2 ± 63.02 140.5 – 149.9	210	144.6 ± 61.90 136.2 – 153.0	66	149.2 ± 79.83 129.5 – 168.8	61	148.6 ± 68.62 131.0 – 166.2	60	147.0 ± 54.4 132.9 – 161.1	41	162.8 ± 86.71 135.4 – 190.2	H (5,N= 1132) =0.9	0.98
<b>total sleep time (hours)</b>	695	7.9 ± 0.8 7.9 – 8.0	210	7.9 ± 0.8 7.8 – 8.0	66	7.9 ± 0.9 7.6 – 8.1	61	7.9 ± 0.9 7.7 – 8.2	60	7.9 ± 0.7 7.7 – 8.1	41	7.8 ± 1.0 7.5 – 8.1	H(5,N= 1133) =2.6	0.75
<b>awake (%TST)</b>	695	8.6 ± 7.8 8.0 – 9.2	210	7.4 ± 8.4 6.3 – 8.6	65	7.2 ± 7.7 5.3 – 9.1	60	6.5 ± 7.5 4.6 – 8.5	60	6.8 ± 8.0 4.8 – 8.9	41	9.3 ± 10.7 5.9 – 12.6	H(5,N= 1131) =23.5	<b>0.0003</b>
<b>Stage 1 (%TST)</b>	695	6.5 ± 4.9 6.1 – 6.8	210	6.3 ± 6.1 5.5 – 7.1	66	6.7 ± 7.5 4.9 – 8.5	61	7.8 ± 7.8 5.8 – 9.8	60	6.6 ± 6.3 4.9 – 8.2	41	8.4 ± 7.3 6.1 – 10.7	H(5,N= 1133) =7.4	0.20
<b>Stage 2 (%TST)</b>	695	47.0 ± 14.0 45.9 – 48.0	210	45.4 ± 9.1 44.1 – 46.6	66	44.7 ± 8.6 42.6 – 46.8	61	45.0 ± 8.9 42.7 – 47.3	60	45.5 ± 6.8 43.7 – 47.3	41	43.7 ± 10.4 40.4 – 47.0	H(5,N= 1133) =9.4	0.10
<b>SWS (%TST)</b>	693	26.4 ± 11.5 25.5 – 27.2	210	26.6 ± 8.4 25.5 – 27.8	66	28.4 ± 9.3 26.1 – 30.7	61	25.9 ± 8.1 23.8 – 28.0	60	29.0 ± 33.2 20.5 – 37.6	41	25.7 ± 7.9 23.2 – 28.2	H(5,N= 1131) =4.5	0.48
<b>REM (%TST)</b>	695	21.0 ± 9.2 20.3 – 21.7	210	21.4 ± 8.4 20.3 – 22.5	66	21.0 ± 10.5 18.4 – 23.6	61	19.9 ± 6.3 18.3 – 21.5	60	23.1 ± 16.1 18.9 – 27.2	41	19.2 ± 13.4 14.9 – 23.4	H(5,N= 1133) =10.2	0.07
<b>SPS</b>	693	0.0 ± 0.7 0.0 – 0.1	208	0.1 ± 0.3 0.0 – 0.1	66	0.1 ± 0.1 0.0 – 0.1	61	0.1 ± 0.2 0.1 – 0.2	60	0.3 ± 0.3 0.2 – 0.3	41	0.4 ± 0.3 0.3 – 0.5	H(5,N= 1129) =267.1	<b>0.0001</b>

Significant results in bold, **AHI**: Apnea Hypopnea Index, **AI**: Apnea Index, **OAI**: Obstructive Apnea Index, **SAI**: Spontaneous Arousal Index, **RAI**: Respiratory Arousal Index, **SEI**: Sleep Efficiency Index,

**SOL**: Sleep Onset Latency, **REM**: Rapid Eye Movement Sleep, **TST**: total sleep time, **SWS**: Slow Wave Sleep, **SPS**: sleep pressure score

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**e-Table 3.** ROC's for the 11 questions in the clinical AHI cut-off groups

Q1-Q4, Q6 :Likert-type responses 'never'[0], 'rarely' (once per week)[1], 'occasionally' (twice per week)[2], 'frequently' (three to four times per week) [3] and 'almost always' (>4 times per week) [4] for the preceding 6 month timeframe. Loudness of snoring (Q5): 'mildly quiet'[0], 'medium loud'[1], 'loud'[2], 'very loud'[3], 'extremely loud' [4]

<b>Q1: Shake child to breathe</b>							
<b>Group 1: AHI≤1 vs.</b>	<b>Criterion</b>	<b>AUC Mean ± SE</b>	<b>p-value</b>	<b>Sensitivity mean 95% CI</b>	<b>Specificity mean 95% CI</b>	<b>Negative Predictive Value (%)</b>	<b>Positive Predictive Value (%)</b>
<b>Group 2:</b>	>0	0.518 ± 0.0240	0.4664	10.64	92.99	78.4	30.3
1>AHI≤2		0.483 to 0.552		6.6 - 16.0	90.8 - 94.8		
<b>Group 3:</b>	>0	0.580 ± 0.0410	0.0518	22.81	92.99	93.3	22.0
2>AHI≤3		0.543 to 0.616		12.7 - 35.8	90.8 - 94.8		
<b>Group 4:</b>	>0	0.534 ± 0.0405	0.3993	14.04	92.99	92.6	14.8
3>AHI≤5		0.497 to 0.571		6.3 - 25.8	90.8 - 94.8		
<b>Group 5:</b>	>0	0.600 ± 0.0429	0.0197	26.92	92.99	94.1	23.3
5>AHI<10		0.563 to 0.636		15.6 - 41.0	90.8 - 94.8		
<b>Group 6: AHI≥10</b>	>0	0.682 ± 0.0509	0.0003	42.86	92.99	96.8	24.6
		0.646 to 0.717		26.3 - 60.6	90.8 - 94.8		
<b>Group 2:</b>							
1>AHI≤2 vs.							
<b>Group 3:</b>	>0	0.564 ± 0.0443	0.1471	22.81	89.36	79.2	39.4
2>AHI≤3		0.500 to 0.627		12.7 - 35.8	84.0 - 93.4		
<b>Group 4:</b>	>0	0.517 ± 0.0440	0.7040	14.04	89.36	77.4	28.6
3>AHI≤5		0.452 to 0.581		6.3 - 25.8	84.0 - 93.4		
<b>Group 5:</b>	>0	0.584 ± 0.0459	0.0669	26.92	89.36	41.2	81.6
5>AHI<10		0.519 to 0.647		15.6 - 41.0	84.0 - 93.4		
<b>Group 6: AHI≥10</b>	>0	0.670 ± 0.0533	0.0015	42.86	89.36	42.9	89.4
		0.604 to 0.731		26.3 - 60.6	84.0 - 93.4		
<b>Group 3:</b>							
2>AHI≤3 vs.							
<b>Group 4:</b>	≤0	0.548 ± 0.540	0.3693	85.96	22.81	52.7	61.9
3>AHI≤5		0.453 to 0.642		74.2 - 93.7	12.7 - 35.8		
<b>Group 5:</b>	>0	0.520 ± 0.0556	0.7248	26.92	77.19	51.9	53.7
5>AHI<10		0.422 to 0.616		15.6 - 41.0	64.2 - 87.3		
<b>Group 6: AHI≥10</b>	>0	0.606 ± 0.0616	0.0847	42.86	77.19	53.6	68.7
		0.499 to 0.707		26.3 - 60.6	64.2 - 87.3		
<b>Group 4:</b>							
3>AHI≤5 vs.							
<b>Group 5:</b>	>0	0.568 ± 0.0551	0.2138	26.92	85.96	63.6	56.3
5>AHI<10		0.470 to 0.663		15.6 - 41.0	74.2 - 93.7		
<b>Group 6: AHI≥10</b>	>0	0.656 ± 0.0601	0.0096	42.86	85.96	65.2	71.0
		0.549 to 0.752		26.3 - 60.6	74.2 - 93.7		
<b>Group 5:</b>							
5>AHI<10 vs.							
<b>Group 6: AHI≥10</b>	>0	0.572 ± 0.0636	0.2551	41.18	71.70	48.3	65.5
		0.462 to 0.678		24.6 - 59.3	57.7 - 83.2		

**AUC:** Area Under Curve, **AHI:** Apnea Hypopnea Index



Q2: Apnea during sleep							
Group 1: AHI≤1 vs.	Criterion	AUC Mean ± SE 95% CI	p-value	Sensitivity mean 95% CI	Specificity mean 95% CI	Negative Predictive Value (%)	Positive Predictive Value (%)
<b>Group 2:</b> 1>AHI≤2	>1	0.518 ± 0.0245 0.483 to 0.553	0.4656	12.09 7.7 - 17.7	91.47 89.0 - 93.5	29.3	78.0
<b>Group 3:</b> 2>AHI≤3	>0	0.585 ± 0.0425 0.547 to 0.623	0.0451	35.85 23.1 - 50.2	81.96 78.7 - 84.9	14.5	93.7
<b>Group 4:</b> 3>AHI≤5	>0	0.605 ± 0.0422 0.567 to 0.642	0.0129	37.04 24.3 - 51.3	81.96 78.7 - 84.9	15.2	93.7
<b>Group 5:</b> 5>AHI<10	>0	0.672 ± 0.0432 0.635 to 0.707	0.0001	50.00 35.5 - 64.5	81.96 78.7 - 84.9	18.2	95.3
<b>Group 6:</b> AHI≥10	>0	<b>0.856 ± 0.0412</b> <b>0.827 to 0.882</b>	<b>0.0001</b>	<b>82.35</b> <b>65.5 - 93.2</b>	<b>81.96</b> <b>78.7 - 84.9</b>	<b>20.0</b>	<b>98.8</b>
<b>Group 2:</b> 1>AHI≤2 vs.							
<b>Group 3:</b> 2>AHI≤3	>0	0.565 ± 0.0457 0.499 to 0.629	0.1553	35.85 23.1 - 50.2	78.57 71.9 - 84.3	32.8	80.8
<b>Group 4:</b> 3>AHI≤5	>0	0.589 ± 0.0454 0.523 to 0.652	0.0506	37.04 24.3 - 51.3	78.57 71.9 - 84.3	33.9	80.8
<b>Group 5:</b> 5>AHI<10	>0	0.655 ± 0.0460 0.590 to 0.716	0.0007	50.00 35.5 - 64.5	78.57 71.9 - 84.3	39.1	85.1
<b>Group 6:</b> AHI≥10	>0	<b>0.844 ± 0.0434</b> <b>0.788 to 0.889</b>	<b>0.0001</b>	<b>82.35</b> <b>65.5 - 93.2</b>	<b>78.57</b> <b>71.9 - 84.3</b>	<b>41.8</b>	<b>96.0</b>
<b>Group 3:</b> 2>AHI≤3 vs.							
<b>Group 4:</b> 3>AHI≤5	>2	0.531 ± 0.0559 0.432 to 0.628	0.5847	18.52 9.3 - 31.4	96.23 87.0 - 99.5	83.3	53.7
<b>Group 5:</b> 5>AHI<10	>1	0.603 ± 0.0558 0.502 to 0.698	0.0639	34.00 21.2 - 48.8	86.79 74.7 - 94.5	70.8	58.2
<b>Group 6:</b> AHI≥10	>1	<b>0.812 ± 0.0500</b> <b>0.714 to 0.888</b>	<b>0.0001</b>	<b>67.65</b> <b>49.5 - 82.6</b>	<b>86.79</b> <b>74.7 - 94.5</b>	<b>76.7</b>	<b>80.7</b>
<b>Group 4:</b> 3>AHI≤5 vs.							
<b>Group 5:</b> 5>AHI<10	>0	0.562 ± 0.0565 0.462 to 0.660	0.2692	50.00 35.5 - 64.5	62.96 48.7 - 75.7	55.6	57.6
<b>Group 6:</b> AHI≥10	>0	<b>0.747 ± 0.0559</b> <b>0.643 to 0.834</b>	<b>0.0001</b>	<b>82.35</b> <b>65.5 - 93.2</b>	<b>62.96</b> <b>48.7 - 75.7</b>	<b>58.3</b>	<b>85.0</b>
<b>Group 5:</b> 5>AHI<10 vs.							
<b>Group 6:</b> AHI≥10	>1	0.703 ± 0.0600 0.593 to 0.797	0.0007	69.70 51.3 - 84.4	66.67 52.1 - 79.2	57.5	77.3

AUC: Area Under Curve, AHI: Apnea Hypopnea Index

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### Q3: Struggle breathing when asleep

Group 1: AHI≤1 vs.	Criterion	AUC Mean ± SE 95% CI	p-value	Sensitivity mean 95% CI	Specificity mean 95% CI	Negative Predictive Value (%)	Positive Predictive Value (%)
<b>Group 2:</b> 1>AHI≤2	>0	0.522 ± 0.0244 0.488 to 0.557	0.3565	33.33 26.6 - 40.7	71.34 67.7 - 74.8	78.4	25.2
<b>Group 3:</b> 2>AHI≤3	>0	0.571 ± 0.0424 0.533 to 0.608	0.0933	43.40 29.8 - 57.7	71.34 67.7 - 74.8	93.9	11.1
<b>Group 4:</b> 3>AHI≤5	>0	0.621 ± 0.0414 0.584 to 0.657	0.0034	51.79 38.0 - 65.3	71.34 67.7 - 74.8	94.4	13.6
<b>Group 5:</b> 5>AHI<10	>1	0.681 ± 0.0429 0.645 to 0.715	0.0001	50.00 35.5 - 64.5	85.20 82.2 - 87.9	95.6	20.8
<b>Group 6: AHI≥10</b>	>1	<b>0.807 ± 0.0450</b> <b>0.776 to 0.836</b>	<b>0.0001</b>	<b>74.29</b> <b>56.7 - 87.5</b>	<b>85.20</b> <b>82.2 - 87.9</b>	<b>98.4</b>	<b>21.5</b>
<b>Group 2:</b> 1>AHI≤2 vs.							
<b>Group 3:</b> 2>AHI≤3	>0	0.548 ± 0.547 0.483 to 0.613	0.2885	43.40 29.8 - 57.7	66.67 59.3 - 73.4	80.3	27.4
<b>Group 4:</b> 3>AHI≤5	>0	0.600 ± 0.0446 0.535 to 0.663	0.0245	51.79 38.0 - 65.3	66.67 59.3 - 73.4	81.9	32.2
<b>Group 5:</b> 5>AHI<10	>1	0.667 ± 0.0457 0.602 to 0.727	0.0003	50.00 35.5 - 64.5	82.51 76.2 - 87.7	85.8	43.9
<b>Group 6: AHI≥10</b>	>1	<b>0.800 ± 0.0467</b> <b>0.741 to 0.851</b>	<b>0.0001</b>	<b>74.29</b> <b>56.7 - 87.5</b>	<b>82.51</b> <b>76.2 - 87.7</b>	<b>94.4</b>	<b>44.8</b>
<b>Group 3:</b> 2>AHI≤3 vs.							
<b>Group 4:</b> 3>AHI≤5	>3	0.554 ± 0.0551 0.456 to 0.650	0.3235	12.50 5.2 - 24.1	96.23 87.0 - 99.5	51.0	77.8
<b>Group 5:</b> 5>AHI<10	>1	0.633 ± 0.0549 0.532 to 0.726	0.0154	50.00 35.5 - 64.5	77.36 63.8 - 87.7	62.1	67.6
<b>Group 6: AHI≥10</b>	>1	<b>0.778 ± 0.0528</b> <b>0.677 to 0.860</b>	<b>0.0001</b>	<b>74.29</b> <b>56.7 - 87.5</b>	<b>77.36</b> <b>63.8 - 87.7</b>	<b>82.0</b>	<b>68.4</b>
<b>Group 4:</b> 3>AHI≤5 vs.							
<b>Group 5:</b> 5>AHI<10	>1	0.578 ± 0.0558 0.478 to 0.673	0.1636	50.00 35.5 - 64.5	71.43 57.8 - 82.7	61.5	61.0
<b>Group 6: AHI≥10</b>	>1	<b>0.723 ± 0.0567</b> <b>0.619 to 0.811</b>	<b>0.0001</b>	<b>74.29</b> <b>56.7 - 87.5</b>	<b>71.43</b> <b>57.8 - 82.7</b>	<b>81.6</b>	<b>61.9</b>
<b>Group 5:</b> 5>AHI<10 vs.							
<b>Group 6: AHI≥10</b>	>2	0.645 ± 0.0621 0.534 to 0.746	0.0196	52.94 35.1 - 70.2	70.59 56.2 - 82.5	69.2	54.5

AUC: Area Under Curve, AHI: Apnea Hypopnea Index



### Q4: Breathing concerns while asleep

Group 1: AHI≤1 vs.	Criterion	AUC Mean ± SE 95% CI	p-value	Sensitivity mean 95% CI	Specificity mean 95% CI	Negative Predictive Value (%)	Positive Predictive Value (%)
<b>Group 2:</b> 1>AHI≤2	>1	0.546 ± 0.0243 0.511 to 0.580	0.0602	32.97 26.3 - 40.3	76.88 73.4 - 80.1	80.2	28.8
<b>Group 3:</b> 2>AHI≤3	>0	0.593 ± 0.0414 0.555 to 0.629	0.0253	53.57 39.7 - 67.0	62.94 59.1 - 66.7	94.1	11.0
<b>Group 4:</b> 3>AHI≤5	>1	0.669 ± 0.0409 0.633 to 0.703	0.0001	51.79 38.0 - 65.3	76.88 73.4 - 80.1	94.9	16.1
<b>Group 5:</b> 5>AHI<10	>2	0.740 ± 0.0408 0.706 to 0.772	0.0001	50.98 36.6 - 65.2	87.29 84.5 - 89.7	95.8	23.9
<b>Group 6:</b> AHI≥10	>1	<b>0.898 ± 0.0353</b> <b>0.873 to 0.920</b>	<b>0.0001</b>	<b>94.29</b> <b>80.8 - 99.3</b>	<b>76.88</b> <b>73.4 - 80.1</b>	<b>99.6</b>	<b>17.9</b>
<b>Group 2:</b> 1>AHI≤2 vs.							
<b>Group 3:</b> 2>AHI≤3	>0	0.547 ± 0.0446 0.481 to 0.611	0.2960	53.57 39.7 - 67.0	55.14 47.7 - 62.4	79.7	26.5
<b>Group 4:</b> 3>AHI≤5	>3	0.631 ± 0.0442 0.566 to 0.692	0.0032	32.14 20.3 - 46.0	90.81 85.7 - 94.6	81.6	51.4
<b>Group 5:</b> 5>AHI<10	>2	0.704 ± 0.0442 0.641 to 0.761	0.0001	50.98 36.6 - 65.2	84.32 78.3 - 89.2	86.2	47.3
<b>Group 6:</b> AHI≥10	>2	<b>0.877 ± 0.0389</b> <b>0.826 to 0.917</b>	<b>0.0001</b>	<b>82.86</b> <b>66.4 - 93.4</b>	<b>84.32</b> <b>78.3 - 89.2</b>		
<b>Group 3:</b> 2>AHI≤3 vs.							
<b>Group 4:</b> 3>AHI≤5	>3	0.589 ± 0.0537 0.492 to 0.681	0.0991	32.14 20.3 - 46.0	85.71 73.8 - 93.6	55.8	69.2
<b>Group 5:</b> 5>AHI<10	>2	0.662 ± 0.0528 0.564 to 0.750	0.0022	50.98 36.6 - 65.2	78.57 65.6 - 88.4	63.8	68.4
<b>Group 6:</b> AHI≥10	>2	<b>0.842 ± 0.0457</b> <b>0.750 to 0.910</b>	<b>0.0001</b>	<b>82.86</b> <b>66.4 - 93.4</b>	<b>78.57</b> <b>65.6 - 88.4</b>	<b>88.0</b>	<b>70.7</b>
<b>Group 4:</b> 3>AHI≤5 vs.							
<b>Group 5:</b> 5>AHI<10	>2	0.563 ± 0.0557 0.464 to 0.659	0.2578	50.98 36.6 - 65.2	62.50 48.5 - 75.1	58.3	55.3
<b>Group 6:</b> AHI≥10	>2	0.732 ± 0.0561 0.629 to 0.819	0.0001	82.86 66.4 - 93.4	62.50 48.5 - 75.1	85.4	58.0
<b>Group 5:</b> 5>AHI<10 vs.							
<b>Group 6:</b> AHI≥10	>1	0.686 ± 0.0601 0.576 to 0.781	0.0020	94.12 80.3 - 99.3	38.46 25.3 - 53.0	90.9	50.0

AUC: Area Under Curve, AHI: Apnea Hypopnea Index





Q5: Snore loudness							
Group 1: AHI≤1 vs.	Criterion	AUC Mean ± SE 95% CI	p-value	Sensitivity mean 95% CI	Specificity mean 95% CI	Negative Predictive Value (%)	Positive Predictive Value (%)
<b>Group 2:</b> 1>AHI≤2	>0	0.556 ± 0.0267 0.517 to 0.594	0.0374	71.15 63.4 - 78.1	37.43 33.2 - 41.8	81.0	25.7
<b>Group 3:</b> 2>AHI≤3	>0	0.642 ± 0.0442 0.601 to 0.682	0.0013	85.71 72.8 - 94.1	37.43 33.2 - 41.8	96.5	11.6
<b>Group 4:</b> 3>AHI≤5	>0	0.660 ± 0.0417 0.620 to 0.699	0.0001	85.45 73.3 - 93.5	37.43 33.2 - 41.8	96.0	12.8
<b>Group 5:</b> 5>AHI<10	>2	0.712 ± 0.0432 0.672 to 0.749	0.0001	45.83 31.4 - 60.8	86.74 83.5 - 89.6	94.5	24.4
<b>Group 6:</b> AHI≥10	>2	<b>0.847 ± 0.0416</b> <b>0.814 to 0.876</b>	<b>0.0001</b>	<b>71.43</b> <b>53.7 - 85.4</b>	<b>86.74</b> <b>83.5 - 89.6</b>	<b>97.8</b>	<b>26.9</b>
<b>Group 2:</b> 1>AHI≤2 vs.							
<b>Group 3:</b> 2>AHI≤3	>0	0.587 ± 0.0479 0.516 to 0.655	0.0706	85.71 72.8 - 94.1	28.85 21.9 - 36.6	86.5	27.5
<b>Group 4:</b> 3>AHI≤5	>0	0.608 ± 0.0456 0.539 to 0.674	0.0178	85.45 73.3 - 93.5	28.85 21.9 - 36.6	84.9	29.7
<b>Group 5:</b> 5>AHI<10	>2	0.668 ± 0.0471 0.599 to 0.732	0.0004	45.83 31.4 - 60.8	82.69 75.8 - 88.3	83.2	44.9
<b>Group 6:</b> AHI≥10	>2	<b>0.819 ± 0.0454</b> <b>0.757 to 0.871</b>	<b>0.0001</b>	<b>71.43</b> <b>53.7 - 85.4</b>	<b>82.69</b> <b>75.8 - 88.3</b>	<b>92.8</b>	<b>48.1</b>
<b>Group 3:</b> 2>AHI≤3 vs.							
<b>Group 4:</b> 3>AHI≤5	>3	0.527 ± 0.0568 0.427 to 0.626	0.6289	14.55 6.5 - 26.7	93.88 83.1 - 98.7	49.5	72.7
<b>Group 5:</b> 5>AHI<10	>2	0.597 ± 0.0576 0.493 to 0.696	0.0910	45.83 31.4 - 60.8	73.47 58.9 - 85.1	58.1	62.9
<b>Group 6:</b> AHI≥10	>2	<b>0.770 ± 0.0540</b> <b>0.666 to 0.855</b>	<b>0.0001</b>	<b>71.43</b> <b>53.7 - 85.4</b>	<b>73.47</b> <b>58.9 - 85.1</b>	<b>78.3</b>	<b>65.8</b>
<b>Group 4:</b> 3>AHI≤5 vs.							
<b>Group 5:</b> 5>AHI<10	>2	0.566 ± 0.0569 0.464 to 0.663	0.2492	45.83 31.4 - 60.8	70.91 57.1 - 82.4	60.0	57.9
<b>Group 6:</b> AHI≥10	>2	0.730 ± 0.0564 0.626 to 0.818	0.0001	71.43 53.7 - 85.4	70.91 57.1 - 82.4	79.6	61.0
<b>Group 5:</b> 5>AHI<10 vs.							
<b>Group 6:</b> AHI≥10	>1	0.654 ± 0.0622 0.542 to 0.755	0.0133	85.29 68.9 - 95.0	40.82 27.0 - 55.8	80.0	50.0

AUC: Area Under Curve, AHI: Apnea Hypopnea Index



### Q6: Snoring during sleep

Group 1: AHI≤1 vs.	Criterion	AUC Mean ± SE 95% CI	p-value	Sensitivity mean 95% CI	Specificity mean 95% CI	Negative Predictive Value (%)	Positive Predictive Value (%)
<b>Group 2:</b> 1>AHI≤2	>1	0.554 ± 0.0242 0.520 to 0.588	0.0261	70.59 63.5 - 77.0	39.10 35.4 - 42.9	82.5	24.6
<b>Group 3:</b> 2>AHI≤3	>1	0.594 ± 0.0410 0.557 to 0.630	0.0215	77.19 64.2 - 87.3	39.10 35.4 - 42.9	95.2	9.8
<b>Group 4:</b> 3>AHI≤5	>2	0.701 ± 0.0399 0.666 to 0.734	0.0001	77.19 64.2 - 87.3	54.74 50.9 - 58.6	96.6	12.8
<b>Group 5:</b> 5>AHI<10	>3	0.722 ± 0.0414 0.688 to 0.755	0.0001	64.71 50.1 - 77.6	70.98 67.4 - 74.4	96.3	14.6
<b>Group 6:</b> AHI≥10	>3	<b>0.855 ± 0.0413</b> <b>0.827 to 0.880</b>	<b>0.0001</b>	<b>100.00</b> <b>89.7 - 100.0</b>	<b>70.98</b> <b>67.4 - 74.4</b>	<b>100</b>	<b>15.0</b>
<b>Group 2:</b> 1>AHI≤2 vs.							
<b>Group 3:</b> 2>AHI≤3	>3	0.544 ± 0.0442 0.479 to 0.607	0.3219	42.11 29.1 - 55.9	66.84 59.6 - 73.5	79.1	27.9
<b>Group 4:</b> 3>AHI≤5	>3	0.658 ± 0.0434 0.594 to 0.717	0.0003	59.65 45.8 - 72.4	66.84 59.6 - 73.5	84.5	35.4
<b>Group 5:</b> 5>AHI<10	>3	0.681 ± 0.0449 0.618 to 0.740	0.0001	64.71 50.1 - 77.6	66.84 59.6 - 73.5	87.4	34.7
<b>Group 6:</b> AHI≥10	>3	<b>0.834 ± 0.0443</b> <b>0.779 to 0.881</b>	<b>0.0001</b>	<b>100.00</b> <b>89.7 - 100.0</b>	<b>66.84</b> <b>59.6 - 73.5</b>	<b>100</b>	<b>35.4</b>
<b>Group 3:</b> 2>AHI≤3 vs.							
<b>Group 4:</b> 3>AHI≤5	>2	0.610 ± 0.0527 0.514 to 0.700	0.0365	77.19 64.2 - 87.3	42.11 29.1 - 55.9	64.9	57.1
<b>Group 5:</b> 5>AHI<10	>3	0.635 ± 0.0537 0.537 to 0.725	0.0121	64.71 50.1 - 77.6	57.89 44.1 - 70.9	64.7	57.9
<b>Group 6:</b> AHI≥10	>3	<b>0.789 ± 0.0519</b> <b>0.691 to 0.868</b>	<b>0.0001</b>	<b>100.00</b> <b>89.7 - 100.0</b>	<b>57.89</b> <b>44.1 - 70.9</b>	<b>100</b>	<b>58.6</b>
<b>Group 4:</b> 3>AHI≤5 vs.							
<b>Group 5:</b> 5>AHI<10	>1	0.527 ± 0.0559 0.428 to 0.624	0.6310	92.16 81.1 - 97.8	14.04 6.3 - 25.8	66.7	49.0
<b>Group 6:</b> AHI≥10	>3	0.702 ± 0.0585 0.597 to 0.793	0.0006	100.00 89.7 - 100.0	40.35 27.6 - 54.2	100	50.0
<b>Group 5:</b> 5>AHI<10 vs.							
<b>Group 6:</b> AHI≥10	>3	0.673 ± 0.0614 0.563 to 0.771	0.0048	100.00 89.4 - 100.0	34.62 22.0 - 49.1	100	49.3

AUC: Area Under Curve, AHI: Apnea Hypopnea Index



<b>Daytime mouth breathing</b>							
<b>Group 1: AHI≤1 vs.</b>	<b>Criterion</b>	<b>AUC</b> Mean ± SE 95% CI	<b>p-value</b>	<b>Sensitivity</b> mean 95% CI	<b>Specificity</b> mean 95% CI	<b>Negative Predictive Value (%)</b>	<b>Positive Predictive Value (%)</b>
<b>Group 2:</b>	>2	0.546 ± 0.0244	0.0568	30.27	77.22	79.3	27.7
1>AHI≤2		0.512 to 0.581		23.7 - 37.4	73.8 - 80.4		
<b>Group 3:</b>	>1	0.572 ± 0.0424	0.0885	50.94	63.81	94.0	10.4
2>AHI≤3		0.534 to 0.609		36.8 - 64.9	60.0 - 67.5		
<b>Group 4:</b>	>1	0.597 ± 0.0418	0.0202	54.55	63.81	94.2	11.5
3>AHI≤5		0.560 to 0.634		40.6 - 68.0	60.0 - 67.5		
<b>Group 5:</b>	>1	0.683 ± 0.0429	0.0001	66.00	63.81	96.0	12.5
5>AHI<10		0.647 to 0.717		51.2 - 78.8	60.0 - 67.5		
<b>Group 6: AHI≥10</b>	>1	<b>0.764 ± 0.0485</b>	<b>0.0001</b>	<b>82.35</b>	<b>63.81</b>	<b>98.6</b>	<b>10.8</b>
		<b>0.731 to 0.796</b>		<b>65.5 - 93.2</b>	<b>60.0 - 67.5</b>		
<b>Group 2:</b> 1>AHI≤2 vs.							
<b>Group 3:</b>	>1	0.523 ± 0.0454	0.6187	50.94	57.84	80.5	25.7
2>AHI≤3		0.457 to 0.588		36.8 - 64.9	50.4 - 65.0		
<b>Group 4:</b>	>1	0.547 ± 0.0449	0.2923	54.55	57.84	81.1	27.8
3>AHI≤5		0.482 to 0.611		40.6 - 68.0	50.4 - 65.0		
<b>Group 5:</b>	>1	0.631 ± 0.0464	0.0048	66.00	57.84	86.3	29.7
5>AHI<10		0.565 to 0.692		51.2 - 78.8	50.4 - 65.0		
<b>Group 6: AHI≥10</b>	>1	0.717 ± 0.0524	0.0001	82.35	57.84	94.7	26.4
		0.653 to 0.776		65.5 - 93.2	50.4 - 65.0		
<b>Group 3:</b> 2>AHI≤3 vs.							
<b>Group 4:</b>	>2	0.531 ± 0.0557	0.5771	38.18	71.70	52.8	58.3
3>AHI≤5		0.433 to 0.628		25.4 - 52.3	57.7 - 83.2		
<b>Group 5:</b>	>2	0.620 ± 0.0553	0.0297	52.00	71.70	61.3	63.4
5>AHI<10		0.519 to 0.714		37.4 - 66.3	57.7 - 83.2		
<b>Group 6: AHI≥10</b>	>2	0.718 ± 0.0580	0.0002	67.65	71.70	77.6	60.5
		0.612 to 0.810		49.5 - 82.6	57.7 - 83.2		
<b>Group 4:</b> 3>AHI≤5 vs.							
<b>Group 5:</b>	>2	0.586 ± 0.0558	0.1225	52.00	61.82	58.6	55.3
5>AHI<10		0.486 to 0.681		37.4 - 66.3	47.7 - 74.6		
<b>Group 6: AHI≥10</b>	>3	0.688 ± 0.0595	0.0016	50.00	80.00	72.1	60.7
		0.581 to 0.782		32.4 - 67.6	67.0 - 89.6		
<b>Group 5:</b> 5>AHI<10 vs.							
<b>Group 6: AHI≥10</b>	>3	0.617 ± 0.0633	0.0645	50.00	72.00	67.9	54.8
		0.505 to 0.721		32.4 - 67.6	57.5 - 83.8		

**AUC:** Area Under Curve, **AHI:** Apnea Hypopnea Index